ARCHIVES OF OTOLOGY.

THREE CASES OF UNINTENTIONAL OPENING OF THE LATERAL SINUS.

By J. E. SHEPPARD, M.D.
ASSISTANT AURAL SURGEON, BROOKLYN EYE AND EAR HOSPITAL.

THESE cases are reported, not with any idea that opening of the lateral sinus is any longer considered the rare or dangerous complication that it formerly was, but because of the combination of this with certain other conditions which seem to make them worthy of record.

CASE 1.—Mr. W., æt. sixty-four. Recommended to me by his family physician, Dr. McCorkle, was first seen January 20, 1892. Has had an attack of influenza, and for the past two weeks severe pain in the left ear, with discharge one week, quite profuse, but not affording any relief to the pain.

Present condition: H.D., w. $\frac{0}{60}$, whisper and conversation 2′–3′. Tuning-fork heard from vertex in left ear, and better by bone- than by air-conduction. A small perforation in post. sup. quadrant of left *Mt*, through which pus, and on inflation air, escape easily. Pain is referred to left half of head, rather more to parietal region and nape of neck than elsewhere. No mastoid tenderness or swelling. One leech was applied in front of tragus, a blister over mastoid apex, and the ear to be syringed with hot water every two hours.

Until February 11th patient was seen every two or three days, and during this time, in spite of active antiphlogistic treatment, there was scarcely any perceptible change in the symptoms. Owing to unavoidable circumstances patient was not seen from February 11th to February 22d, when he again came to the office and reported a continuance, perhaps slight increase, of the pain and discharge. The perforation has taken on a pouting, teat-like appearance, posterior wall of bony canal slightly bulging, and for

the first time deep pressure and percussion over the mastoid, which was still free from redness and swelling, caused the patient to say it was *slightly* tender.

On these grounds, which seemed to me at the time rather slight, I recommended operative interference. The next day, Doctors Alderton and Simmons assisting, I cut down on the bone, and, finding no soft spot, began with the chisel. At the first tap with the mallet, the chisel perforated the bone as if it were a mere egg-shell. A large quantity of pus, seemingly from one to two ounces, escaped. A large portion of the external cortex was removed, and an enormous cavity found containing, beside the pus, much granulation tissue. While curetting this away there was a sudden large flow of venous blood, which, however, soon ceased with pressure, and the curetting was carefully finished. Then on gently using the probe to more thoroughly investigate the condition of the inner wall of the mastoid, at one point, with scarcely more than its own weight, it entered the cranial cavity a distance of $2\frac{1}{2}$–3 inches. The mastoid cavity was then gently syringed out with carbolic solution (1–40), the fluid passing from behind forward through *Mt* and canal, and *vice versa*—the wound carefully dried, and packed with iodoform gauze.

The after-oozing was very slight. For four days the patient did well, the highest temperature being 99.4.° On the morning of the 27th, at 9 o'clock, temp. 98.4° ; at 11.30 A.M., however, patient woke out of sleep with a severe chill which lasted an hour. When I saw him at 12.30 chill was just passing off, and temp. was 102.5°. Dressing at once removed and cavity syringed out. After drying it was found with the probe that the inner, bony wall of the mastoid cavity was absent for a space as large as an ordinary 25-cent piece, leaving only a membranous separation of the large pus cavity from the brain, and in this membrane were plainly seen the two points at which it had been punctured during the operation, once with the curette into the sinus, the other time with the probe into the cranial cavity. That evening, temp. 100.4° —the next morning 98.4°—twice after that 99.4°—with these exceptions never again above normal. From that time there was an uninterrupted, though slow, recovery, the patient being discharged cured August 12, 1892.

On September 16th, one month later, patient returned at Dr. McCorkle's request, with the history that during the past month he had had repeated attacks of vertigo, having twice fallen and

lost consciousness. On several occasions had barely avoided falling by quickly grasping something or sitting down. During the attacks face becomes bluish-pale, breathing frequently irregular, pulse very slow. When in the office pulse 30 to 36. The attacks are not attended with increased tinnitus, or impairment of hearing. I gave the opinion that attacks were not in any way connected with the ear. Heard two or three months later that the patient had entirely recovered his usual health under simple tonic treatment.

On April 24, 1893, Mr. W. called upon me. Reports himself in good health. *Mt* is quite opaque and slightly retracted. H.D., w. $\frac{C}{60}$, whisper 5′, conversation 35′.

The interesting features of this case seem to me to be: (1) The relatively slight symptoms preceding, and indicating operation, compared with the enormous destruction of tissue within the mastoid, involving even a large portion of the inner wall, as well as the absence of any serious consequences from the double puncture, into the lateral sinus, and into the brain cavity. (2) The severe chill on the fourth day after operation, preceded by no unpleasant symptoms, and followed by an uninterrupted recovery. I am inclined now to believe that, had I dressed the wound a day earlier, even this might have been avoided. (3) The attacks of vertigo with loss of consciousness, irregular respiration, and slow pulse during the month following the final healing. My subsequent thought on this subject has crystallized into this query: In the absence of a bony wall between the mastoid and cranial cavities, could the cicatricial contraction have caused sufficiently increased intra-cranial tension to account for the symptoms?

Case 2.—Miss E., æt. twenty-one, came to my clinic at the Brooklyn Eye and Ear Hospital, March 14, 1893. She gave a history of discharge from the right ear for two months, preceded, and accompanied, by severe pain in and behind the ear, and somewhat over the side of the head, and always worse at night.

Examination showed H.D., w. $\frac{0}{60}$, whisper 7′. Tuning-fork from vertex in right ear, in which it is better heard by bone- than by air-conduction. Auricle pushed considerably outward from

side of head ; behind it a large, red, very tender swelling, extending downward about one inch from the level of the upper margin of auricle (patient says this has existed only two or three days) ; posterior and superior canal walls bulged considerably into the canal, which is filled with pus ; *Mt* only partially visible, but perforation whistle results from inflation of the middle ear. Recommended immediate operation, which was done the following day, March 15th, in the presence of Drs. Alderton and Simmons.

The tissues overlying the bone were very much infiltrated ($\frac{3}{4}$–1 inch thick), periosteum loosened, surface of bone much roughened, but with no overlying pus. At one point the bone was greatly softened ; on commencing to curette this with a sharp spoon, I found the whole outer cortex could be scooped away in this manner, no chisel being needed. A large opening was thus made, with the escape of considerable pus ; a large amount of granulation and necrotic tissue was curetted away, observing, however, the utmost caution, since I had, on finding the cortex so diseased, remarked the danger of opening the sinus in such a case. Finally, while clearing out the upper, inner, and posterior part of the cavity, the assistant was drying it out with a pledget of cotton, on removing which there was a large flow of dark venous blood. Further proceedings were stopped, the cavity firmly plugged with cotton while the parts were cleansed, and after its removal was packed tightly with iodoform gauze, covered with plenty of cotton and a tight bandage.

Oozing not more than ordinary. First dressing March 17th, no hemorrhage, wound looking well, lightly syringed, and packed with gauze. Highest temperature recorded was 24 hours after operation, 100.6°. Pain entirely relieved. At the second dressing, March 20th, the perforation of *Mt* was found healed. Left the hospital to become an out-door patient, March 31st.

Recovery has, considering the external swelling, the amount of necrosed bone, etc., before operation, been rather unusually rapid, there having been no untoward symptoms, the patient being discharged, with the wound entirely healed, June 5th.—H.D., w. 30″, whisper and conversation 40+′.

In this case the prominent features are : (1) the manner in which the sinus was apparently opened—*i. e.* the flow of blood came after removing a pledget of cotton used for drying out the cavity. It seems probable that with the

curette a piece of necrotic bone was made to wound the sinus wall, but was not sufficiently displaced to allow of hemorrhage until caught in the cotton and removed. (2) The entire absence of disturbing symptoms, with relatively short time required for entire healing of the wound.

Just as I was finishing the report of the above cases, I was called upon to operate upon a case of mastoiditis, which proved to be my third case of opening the sinus. The history follows:

CASE 3.—Mrs. McL., æt. fifty-five, came to me at the Brooklyn Eye and Ear Hospital, May 12, 1893. She reports herself as convalescent from a recent attack of "grip,"—has had for two weeks severe pain localized behind the right auricle, with constant pulsating tinnitus, and some hardness of hearing.

Present condition: H.D., w. R $\frac{1}{60}$; L $\frac{1.p.}{60}$; whisp. R 5′, L 4′. Tuning-fork, from vertex better in right ear. In both, bone-conduction better than air-. Over the right mastoid, where the pain is located, is a distinctly localized point of tenderness to both pressure and percussion. Right canal, normal; moderate redness of *Mt*, especially marked over attic and hammer handle. Left canal, walls somewhat irritated; outer layer of *Mt* white and loosened, masking an underlying markedly red *Mt* and slight bulging of the postero-superior quadrant. *Treatment*, gentle inflation; two leeches over tender part of right mastoid, one in front of left tragus. Cold locally to right mastoid. The inflammation in the left ear yielded readily to this treatment without rupture of the *Mt*. In right side, the redness of attic and handle subsided somewhat, but the mastoid pain and tenderness, although yielding temporarily to the blood-letting, were practically unchanged up to May 20th, on which date operation was decided upon and performed in the presence of Drs. Simmons, Waugh, and Butler.

Pus was found immediately under the cortex in a few of the superficial cells, and I believe that the operation might just as well have been concluded at this point. I decided, however, to work inward toward the antrum. While doing this, and when well forward, close to the posterior wall of the external auditory canal, there was the flow, not at first very profuse, but constantly increasing, of dark venous blood, indicative of opening of the lateral sinus. The wound was packed with cotton during cleans-

ing, and then with gauze, and tightly bandaged. No more than ordinary after-oozing. Highest temp. 99:6°, the day following the operation. Pat. left the hospital June 5th, and the wound is now healing rapidly. Hearing about normal in both ears.

It is a rather curious fact that in this case the mastoid suppuration occurred on the side upon which there was apparently a lesser grade of inflammation in the tympanic cavity. The tympanic inflammation was certainly much greater, when the patient was first seen, upon the left side. The fact of the pus being found *only* in a few of the superficial cells coincides with the idea expressed by Politzer in his article, "De l'ouverture de l'apophyse mastoïde, etc., à la suite de l'influenza," in the *Annales des maladies de l'oreille, du larynx*, etc., for May, 1892, viz.: "It is very important to know that these cavities" (a certain class he is describing) "hardly ever communicate with the mastoid antrum; the abscess is nearly always isolated. . . . Further, one must never in these cases seek to establish an artificial communication between the abscess cavity and the antrum," etc. From my experience with this and two or three other similar cases, I certainly believe with Politzer that an extension of the operation to the antrum is in certain cases at least superfluous, if not indeed worse.

It is difficult for me to explain how the sinus was opened in this case;—at the time, the curette was well forward toward the antrum, and no great force was being used. The only plausible explanation that occurs to me is that with the curette I may have splintered the inner plate, the posterior end of the splinter penetrating the sinus wall.

The case is further unusual from having no severe, indeed only a very slight, inflammation of the tympanic cavity, without at any time a perforation of the membrana tympani.

SHORT DESCRIPTION OF THE TEMPORAL BONES OF DEAF-MUTES BELONGING TO THE PATHOLOGICAL MUSEUM OF THE COPENHAGEN UNIVERSITY.

By HOLGER MYGIND, Copenhagen.

THE collection of temporal bones of deaf-mutes in the Pathological Museum of the University of Copenhagen, which collection, as far as the number of preparations and the care with which they are made are concerned, is certainly unique, has not, up to the present—at least outside Denmark—received the attention it deserves as yielding an important contribution to the morbid anatomy of deaf-mutism and ear diseases in general.

Several authors have described single specimens or the more important. Four of them formed the basis of an article by Mürer[1]; E. Schmalz[2] makes a short mention of them (in all seven preparations).[3] Further, the description of the preparations contained in the University catalogue has been partially reproduced by Bremer,[3] where there were abnormities in the bony parts of the hearing organs. Bremer's description was unaccompanied by any information concerning the history of the deaf-mutes, as he had been unable to discover the catalogue of the preparations in

[1] Mürer: De causis cophoseos surdo-mutorum indagatu difficilibus commentatis brevis sectionibus cadaverum ut plurimum illustrata. Havniæ, 1825.

[2] Schmalz, E.: Kurze Angaben der pathologischen Veränderungen der Gehörorgane, welche von einigenan dern Aerzten bei der Section Taubstummer gefunden worden sind. Beiträge zur Gehör-und Sprachheilkunde. Leipzig, 1848, S. 164–167.

[3] Bremer, Victor: Om det pathologishe Fund hos böovstumme. Kjobenhavn, 1880.

the archives of the Royal Copenhagen Deaf-and-Dumb Institution, to which the University catalogue refers (all the deaf-mutes in question having been inmates of this institution) in the heading and at each single preparation; hence his work lost much in value, many of the conclusions drawn being incorrect, a fact which has been plainly proved by Mygge.[1] Thanks to the latter author, the value of the collection has been considerably increased, as he, from information which he found in the medical reports in the archives of the said Deaf-and-Dumb Institution, was able to make up for the supposed loss of the catalogue, and thus collect information as to the history of most of the deaf-mutes whose temporal bones are contained in the collection. Mygge at the same time brought together particulars as to the origin and history of the collection. Finally, the author of this article has several times had occasion to mention several of the preparations, and has also published a short description of the most important abnormities which they exhibit.[2]

Mygge's description of the preparations of the temporal bones of deaf-mutes in the Pathological Museum in his above-mentioned article is the most exhaustive that has as yet been published. It embraces all those temporal bones which have afforded positive results on investigation as to existing abnormities, and also gives information as to the history of the deaf-mutes themselves. Mygge has, however, considered himself bound only to give a reproduction of the descriptions of the preparations as given in the catalogue of the Museum and the archives of the Copenhagen Royal Deaf-and-Dumb Institution. As, however, the descriptions of these two literary sources disagree on several points concerning different abnormities, and a closer investigation proved that important abnormities were entirely omitted, whilst others were incorrectly or deficiently explained, and as, finally, several errors had crept into the

[1] Mygge: Nogle Bemaerkuniger om Studiet af böostumhedens Ætiologi og Pathogenese, fremkomne i Anledning af Dr. V. Bremer's Afhandling, "Om det pathologishe Fund hos böostumme; saerligt i baumark."—*Ugeskrift for Laeger*, 4de Raehle, Nr. 22.

[2] Mygind: "Uebersicht über die pathologisch anatomischen Veränderungen der Gehörorgane Taubstummer." — *Archiv für Ohrenheilkunde*, Bd. 30, S. 76.

descriptions which have been published, I have been induced to bring forward this important collection in its entirety. I must, however, add that I have not considered myself authorized in making any further preparation of the specimens. I have not, therefore, been able to submit all the parts of the organs of hearing belonging to the temporal bone to so minute an investigation as I could have wished, owing to the way in which some of the specimens are prepared. Further, I have everywhere made use of the descriptions mentioned above as a basis for my work, especially in describing such abnormities the nature of which might be dubious, particularly when there might be a question of these having been produced in preparing the specimen; for instance, absence of the drum-head, the ossicula auditus, etc.

I have had no difficulty in collecting material for the history of the collection, as Mygge had already paved the way in the above-mentioned work, by the investigations he had made in the archives of the Copenhagen Deaf-and-Dumb Institution, which were kindly placed at my disposal by Pastor Heiberg, the director of that establishment.

From the archives it appears that the collection originated in Mürer (who was a medical attendant to the Deaf-and-Dumb Institution of Copenhagen from the 29th of April, 1823) making a post-mortem examination of a deceased inmate, No. 7, Christian Henrik Sophûs Bölle Leonhardsen, died April 16, 1824, whose left temporal bone, No. 10 in the catalogue of the Pathological Museum, was prepared by Lieutenant-Surgeon Laurent.

From a paper by Mürer addressed to the Committee of the Institution it would appear that this post-mortem, which is elsewhere described by Mürer in the paper mentioned above, was performed by order of the committee, who also decided that the organs of hearing should be prepared and preserved in the Institution. There is also a paper which seems to prove that the committee was careful that its orders were carried out. The next specimens in the collection, which, in this way, was originally connected with the Deaf-and-Dumb Institution, are both temporal bones of

a deceased pupil, No. 22, Louisa Augusta Danielsen, died the 7th of June the same year. Laurent prepared these specimens as well. His receipt for 16 *Rigdaler* (32*s.*), which was his fee (including glass case and turned stand), is to be found in the archives. The post-mortem was, however, performed by Mackeprang, who was Mürer's *locum tenens* at the Institution at that time, and also house-surgeon at the Copenhagen General Hospital, where the deaf-mute died. These two specimens, which are also mentioned by Mürer in his paper, showed no abnormities on investigation; they are numbered 54 and 55 in the Museum collection. It seems that no post-mortem was performed on deceased pupils for some time. This was not owing to a want of interest in the matter, as several papers of the archives speak of the ineffectual efforts that have been made to induce parents of deceased pupils to allow of post-mortems being performed. On the 11th of February, 1826, Mackeprang, who in the meantime had become medical attendant to the Institution, again performed a post-mortem, and the temporal bones were removed and prepared. In the ten years subsequent, Mackeprang performed post-mortem examinations on a large number of deaf-mutes from the Institution, most of whom died at the General Hospital, where M. was house-surgeon until 1848. As a rule, he removed the temporal bones for preparation as specimens. According to Mygge's investigations, it was highly probable that the preparation of these temporal bones was entrusted to Dr. Ibsen, whose great skill as preparator is evinced by the care and delicacy with which the task was performed. A further proof that it is to Ibsen that we owe the specimens, is afforded by his paper on investigations of the labyrinth,[1] which appeared several years after his death, and in which he says: "A considerable collection of specimens of organs of hearing, which has been presented to the Anatomical Museum of the University by the Deaf-and-Dumb Institution, and the readiness with which Dr. Mackeprang, medical

[1] T. Ibsen: Anatomishe Undersögelser over Orets Labyrinth. Splultet af Foofalteren i 1846, nu udgivet paa Carlsbergfondets Behostuing af P. L. Panum. Kjöbenhavn, 1881.

attendant to the Institution, has allowed me to assist in the post-mortem of pupils, have given me opportunity to observe," etc.

A couple of specimens (No. 18 and 19) are, however, not the work of Ibsen, but, according to Mackeprang's report of the death of the deaf-mute in question, were made by Mr. Larsen.[1] This probably refers to Larsen, later head-surgeon to the Copenhagen General Hospital, who was at that time appointed as interne there. These specimens, however, differ in no wise from the others, as far as the mode of preparation is concerned. The last post-mortem reported by Mackeprang to the committee took place in 1837.[2] It was in 1837 that Ibsen was appointed Professor of Anatomy at the Copenhagen University, and it is probable that his time from then was too much occupied to allow him to prepare specimens which, to judge from their appearance, have certainly been no slight undertaking. By placing the deaf-mutes, whose organs of hearing Mackeprang reports as being removed post-mortem, in chronological order according to the date of their death, we obtain a list of fifty-seven deaf-mutes, and fifty-seven is the highest number in the lost catalogue, to which the Museum Catalogue refers in a couple of specimens.

The fact that so large a number of post-mortem examinations could be performed at the Deaf-and-Dumb Institution in so short a time, proves that its medical attendant, Mackeprang, who performed nearly all, took a lively interest in scientific matters, which is the more remarkable, as post-mortems on deaf-mutes were then, and for some time later, rare occurrences. It is, therefore, principally owing to him that the

[1] It is a remarkable circumstance that Mackeprang makes no mention of Ibsen's name. The reason is perhaps that the latter, according to the account books of the Institution, which, however, give no name, received payment for his work, which amounted to about 10 Rigsdaler (= £1) for each pair of specimens.

[2] Mygge has not been able to prove from the archives whence the two last specimens came, but believes them to belong to deaf-mutes examined post-mortem in 1843 and 1844, as Mackeprang does not mention the removal of organs of hearing in his annual medical reports in 1837–1842, whilst the reports for 1843–44 are missing from the archives. A closer investigation shows that Mackeprang mentions the removal of the organs of hearing, as far as the deaf-mute examined by post-mortem in 1837 is concerned, in his *monthly* reports, though not in his annual.

Copenhagen University is in possession of such a large collection of temporal bones of deaf-mutes. As a great number of these specimens showed no abnormities, it was to be expected, that Mackeprang would have found pathological changes on examining the auditory nerve or the brain. Of these he makes no mention in his reports, he everywhere uses the expression "the soft parts of the organs of hearing offered nothing abnormal." This, it seems, can only be explained by supposing the examination to have been deficient in this respect.

By the request of Professor Fenger, the collection was, in 1844, presented by the Deaf-and-Dumb Institution to the Pathological Museum of the Copenhagen University "to serve as an important aid in the education of future medical men." A written catalogue was then made of all the specimens, which were placed in case A. In this catalogue the specimens were renumbered. It is impossible to discover what order was followed in this re-arrangement, but it is evident that specimens exhibiting abnormities received a low number, whilst those exhibiting no abnormities received a higher number in the order in which the deaf-mutes died, and were mentioned in the lost catalogue. Besides, some specimens were labelled with the full name and date of death of the deaf-mute in question, and the description of each specimen in the Museum catalogue refers to a certain number in that of the Deaf-and-Dumb Institution. As mentioned above, it has been possible to reconstruct this catalogue with the help of Mackeprang's medical reports to the Committee of the Deaf-and-Dumb Institution, which reports, when the investigations of the temporal bones give a positive result, contain a description of the abnormities found. These descriptions are, in many cases, word for word the same as the corresponding ones in the Museum catalogue; in many cases the two descriptions do not differ so much as to cause any doubt as to the identity of the specimens in question. As Mackeprang's reports say nothing as to the cause of deafness in the cases in question, neither as to the deaf-mute's place of residence, etc., I have been unable to glean anything from them in this respect. But Mackeprang

always gives the deaf-mute's number in the books of the Institution, and as these contain ample particulars it has been possible to obtain the information which is given below as to each separate deaf-mute.

The collection contains 110 specimens (not including one which was added several years later and owning another origin). Each of these is the preparation of one temporal bone. In all cases except two (Nos. 11, 15 and 59), the labyrinth is opened either by several sections or by chiselling out the bony walls. The first method is employed in specimens 10 and 11, 12 and 13, 14 and 15, 16 and 17, 57 and 58, in which cases a saw has, without doubt, been used; the second is employed in all the remaining cases. In the latter mode of preparation the bony walls have been partially chiselled away to afford a view of the cavities of the labyrinth. This chiselling has been performed so as to perfectly preserve the form of the labyrinth, without, on the other hand, as a rule, hindering a full view of the labyrinthal cavities and the pathological changes they so often contain. The specimens are numbered from 10 to 119 and are arranged so that each even number, with the following odd number, represents a pair of temporal bones from the same individual. The collection then consists of specimens taken from 55 deaf-mutes.[1]

NO. 10 AND 11.

Pupil No. 7. Christian Sophûs Henrik Bölle Leonhardsen. Born March 11, 1813, in Veilöe Parish, Præstö County. Entered May 3, 1821. According to the mother's account *became deaf when two years old*, the result of an *acute fever*. Died April 16, 1824, of tuberculosis.[2]

---

[1] As Mackeprang in his report speaks of the removal of the temporal bones of fifty-seven deaf-mutes, it will be seen that two pairs are missing. The first of these belonged to pupil No. 2, Dorothea (Clausdatter, who was the first pupil on whom post-mortem was performed. According to a bill found in the archives this specimen was preserved in spirit in a jar. The other pair belonged to pupil No. 42, Jens Redersen, No. 51 of those examined post-mortem. Mackeprang states that the external auditory canal was narrowed and that membrana tympani and the ossicula auditus were wanting. Both pairs of specimens seem to have been lost.

[2] Under the heading "Tuberculosis" are included in the following all diseases in the various organs mentioned in the post-mortem as "scrophulous swellings," "suppurating glands," etc.

No. 10. Left temporal bone. Membrana tympani and ossicula auditus present and of natural appearance. All the semicircular canals are closed in their central $\frac{2}{3}$ by a bony mass, which without any sharp boundary line unites with the surrounding bone, but differs from this, having a more spongy appearance. The openings of the semicircular canals into the vestibule appear as a short *cul-de-sac*.

No. 11. Right temporal bone. This bone has not been prepared, excepting that the tympanum has been opened from above. The malleus and incus are present and of natural appearance. Membrana tympani and stapes have been lost in or after preparation.[1] (The two specimens are described by Mürer, see above.)

NO. 12 AND 13.

Pupil No. 8. Ane Marie Christensdatter. *No information as to the cause of deafness.* Born in the parish of Starup in the county of Veile ; christened January 8, 1809. Admitted November, 1819. Died February 11, 1826, of tuberculosis.

No. 12. Right temporal bone. Only the internal wall of the tympanum is visible ; the rest, including the ossicula auditus and membrana tympani, having been removed. Only the cavity of the first turn of the cochlea is plainly visible ; in its commencement is a distinct lamina spiralis, nothing in its termination. The upper end of the first turn opens into a large cavity, which occupies the entire remainder of the cochlea, and in which there is no trace of the modiolus. At the top of this cavity is the trace of a rim attached to the wall, which is the remains of the partition wall between the first and second turns, and which completely divides the cavity into a larger under and a lesser upper division.[2] On the posterior surface of the petrous bone is a deficient ossification of the parts lateral to the aquæductus vestibuli and reaching to fossa sigmoidea ; the external wall of the posterior semicircular canal is thus laid bare for the greater part, appearing as a horn, narrower above and broader below. The aquæductus vestibuli is somewhat wider than normal.

[1] When stating that membrana tympani and ossicula auditus are wanting as the result of preparation, this, here and in the following, is supposed to be the case, as this want is not mentioned in the catalogue.

[2] According to remarks in the catalogue it would appear, that it was at first doubtful whether the absence of the partition wall in the left ear, which was the first prepared, was not due to sawing, but as far as the right ear was concerned it is stated : "A more careful preparation proves that the partition wall is missing.

No. 13. Left temporal bone. Exhibits the same abnormities as the right ; the lamina spiralis, however, retains its size throughout the first turn.

No. 14 and 15.

Pupil No. 17. Nick Pedersen Fogh. Born May 5, 1809, in the parish of Holme, Aarhus County. Admitted June 4, 1824. According to the clergyman of the parish the child was *born deaf*. Neither of the parents deaf and dumb ; the mother insane and separated from her husband on that account. A sister who died when six years old was born deaf. Died April 6, 1826, of tuberculosis.

No. 14. Left temporal bone. Membrana tympani, malleus, and incus are present, stapes lost (in preparation). The aquæductus vestibuli, wider than normal, especially outwards towards the petrous bone. There has doubtless been the same abnormity in the posterior surface of the petrous bone as mentioned in the description of the right temporal bone, but the preparation does not permit a more minute investigation.

No. 15. Right temporal bone. Membrana tympani and malleus visible. The aquæductus vestibuli same as left. On account of deficient ossification, the external wall of the posterior semicircular canal is visible on the posterior surface of the petrous bone, though not so distinctly as in specimens 12 and 13. The labyrinth is otherwise neither opened nor chiselled out.

No. 16 and 17.

Pupil No. 32. Paul Henricksen, born 1811 in Skagafjord, Iceland. Admitted September, 1820. According to his brother's account, the boy *became deaf when four years old after an illness ;* intelligent and one of the best scholars. Died January, 1827, of tuberculosis.

No. 16. Left temporal bone. Stapes deformed, the two normal crura being missing. Fenestra ovalis present, leading to a small hour-glass-shaped cavity, which in height and position corresponds to the vestibule. In the tympanum is an opening corresponding to the fenestra rotunda, leading to a small cavity whose course, however, cannot be traced owing to mode of preparation. There is no further trace of the normal cavities of the labyrinth, as the whole petrous bone is formed of a firm osseous tissue, which in the parts corresponding to the normal seat of the

labyrinth is harder and whiter, though the contour of the labyrinth cannot be distinctly made out. The meatus auditorius internus somewhat narrow; in the bottom of it is one opening which in shape, size, and position corresponds to the normal for the nervus facialis; there is no trace of foramina cribrosa.

No. 17. Right temporal bone. Exhibits principally the same abnormities as the left. The cavity corresponding to the vestibule is, however, somewhat larger and more triangular. On account of the mode of preparation nothing can be distinctly stated as to the fenestræ ovalis and rotunda. The contour of the cochlea is in one place plainly visible in the osseous mass.

NO. 18 AND 19.

Pupil No. 35. Reder Madsen. Born April, 1810, in the parish of Semmerbölle, Svendborg County. Admitted December 16, 1892. *No information as to the cause of deafness.* Died September 12, 1828, of tuberculosis.

No. 18. Left temporal bone. Membrana tympani and ossa auricula present. Vestibule unopened. Meatus auditorius internus somewhat wider than normal.

No. 19. Membrana tympani removed, ossicula auditus present. The middle third of the posterior semicircular canal, and about the middle half of the external semicircular canal are filled with a firm, white, ivory-like osseous substance.

NO. 20 AND 21.

Pupil No. 8. Ane Nielsdatter, born August 4, 1817, in the parish of Breininge, Ringkjobing County. Admitted March 29, 1827. According to the clergyman's certificate she was *born deaf*, as nothing is known that could have caused the deafness; none of her relations were deaf-mutes. Died of tuberculosis March 6, 1829.

No. 20. Left temporal bone. Excepting that the meatus auditorius internus is somewhat narrowed, there is no abnormity.

No. 21. Right temporal bone. Exhibits the same abnormity as left, but in lesser degree.

NO. 22 AND 23.

Pupil No. 14. Christen Redersen. Born February 13, 1814, in the parish of Oelstgkke, Fredericksborg County. Admitted July

6, 1822. According to the parents, *deaf from birth.* Died March 12, 1829, of tuberculosis.

No. 22. Left temporal bone. Not the least trace of the posterior semicircular canal. Vestibule considerably diminished in size. Crura ampullaria of the superior and external semicircular canal are united into one canal. Meatus auditorius internus does not present itself as a canal in the bone, but as a broad, flat hollow, in which there is a large opening leading to the first turn of the cochlea.

No. 23. Right temporal bone. Exhibits the same abnormities as the left. The opening communicating between the cochlea and the above-mentioned hollow is even larger than in the left bone.

NO. 24 AND 25.

Pupil No. 13. Reder Larsen. Born December 24, 1821, in the parish of Hellebach, Fredericksborg County. Admitted July 1, 1829. According to the clergyman's certificate was *born deaf* and has a deaf-and-dumb brother. No other deaf-mutes in the family. The books of the Institution show, however, that there was a younger deaf-and-dumb sister, who died later at the Institution, and whose temporal bones form specimens 52 and 53 of this collection. Died October 26, 1829, of pleuritis and nephritis suppurativa.

No. 24. Left temporal bone. Membrana tympani and ossicula auditus present. Modiolus and lamina spiralis disappear entirely in the second turning, and the partition between the second and third turnings is wanting, a large cavity being thus formed in the top of the cochlea, whilst the base is occupied by the whole of the first and a part of the second turning, the internal osseous structure of which is normal. Aquæductus vestibuli much wider than normal.

No. 25. Right temporal bone. Exhibits the same appearance as the left; aquæductus vestibuli, however, cannot be seen owing to the method of preparation.

NO. 26 AND 27.

Pupil No. 37. Jon Thorkelsen, born 1812 in Shagestrand, Iceland. Admitted August 20, 1884. *No information as to cause of deafness.* Whilst in the Institution was attacked by tussis convulsiva and morbilli. Died, February 23d, of pleuritis and pericarditis, resulting from scarlatina.

No. 26. Left temporal bone. Membrana tympani and ossicula auditus present (stapes, however, has been lost by the preparation). The middle $\frac{2}{4}$ of the posterior semicircular canal are filled by an osseous mass, which in nowise differs from the surrounding bone. The external opening of aquæductus cochleæ is situated on the posterior surface of the petrous bone and is much extended ; the canal itself is closed.

No. 27. Right temporal bone. Membrana tympani and ossicula auditus present. The inferior $\frac{2}{3}$ of the posterior semicircular canal closed as on the left side. No abnormity in the external orifice of aquæductus cochleæ, but the canal itself is probably closed.

NO. 28 AND 29.

Pupil No. 5. Hans Johansen. Born April 8, 1821, in the parish of Flödstrup, Swendborg County. Admitted July 1, 1829. According to the clergyman's certificate, was *born deaf ;* neither of the parents, nor any of their other children, were deaf-and-dumb ; was intelligent ; died March, 5, 1830 of tuberculosis.

No. 28. Left temporal bone. Membrana tympani and ossicula auditus present. Modiolus and lamina spiralis disappear after the formation of $1\frac{1}{2}$ turnings of the cochlea. The partition between the remaining turnings is missing ; there is in this way formed a large cavity in the top of the cochlea, in which a low ridge is visible, the remainder of the partition wall ; the base of the cochlea is occupied by the whole first and half of the second turning, the interior osseous structure of which is normal, excepting that the scala vestibuli is much wider than normal. The semicircular canals are much narrowed. The aquæductus vestibuli somewhat wider than usual.

No. 29. Right temporal bone. Exhibits the same abnormities and conditions as the left.

NO. 30 AND 31.

Pupil No. 3. Iver Iversen, born December 18, 1820, in the parish of Hartse, Vejle County. Admitted July 30, 1828. Was *born deaf*, according to the certificate from parochial authorities, but neither his parents nor his only brother were deaf-mutes. Whilst in the Institution was attacked by morbilli. Died April 20, 1830, of tuberculosis.

No. 30. Left temporal bone. Tympanum high and narrow with only a trace of the promontorium. Membrana tympani and

ossicula auditus are wanting. The entrance to the Eustachian tube is completely closed, as is also the case with canalis tensoris tympani, and the entrance to antrum mastoideum. The state of the two fenestræ cannot be clearly decided, but a large upright fissure is visible leading from the tympanum and vestibule to the cell-like cavities mentioned below. The external semicircular canal is filled in the central $\frac{2}{3}$ by an osseous mass, which does not differ from the surrounding bone in appearance or consistency. The anterior crus of the superior semicircular canal is of the width proper to the canal, whilst the posterior crus is completely filled by a spongy osseous mass, the small cavities of which seem to be in connection with cellulæ petrosæ, which are strongly developed outwards towards the tympanum, the place of which is partially occupied (see above). The state of the vestibule cannot be decided owing to the mode of preparation.

No. 31. Right temporal bone. Tympanum of a good size, with distinct promontorium; both fenestræ plainly visible and of normal appearance; membrana tympani and ossicula auditus wanting. The middle $\frac{1}{3}$ of the posterior semicircular canal completely filled by a chalk-like mass.

NO. 32 AND 33.

Pupil No. 34. Marie Hansdatter, born March 17, 1818, in the parish of Naesby, Praestö County. Admitted August 10, 1828. According to the clergyman's certificate, she *was able to hear and speak until two and one half years old, when she had morbilli* followed by considerable swellings (round the ears?), with the formation of ulcerations which took a long time to heal; from this time the child lost the power of hearing and speaking. Neither of the parents nor their other children are deaf-mutes. Died March 17, of tuberculosis.

No. 32. Left temporal bone. Membrana tympani and ossicula auditus, with the exception of stapes, are wanting (result of preparation?).

No. 33. Right temporal bone. Membrana tympani and ossicula auditus are wanting; the post-mortem showed signs of caries in the tympanum. The middle third of the exterior semicircular canal is filled by an osseous mass; the anterior crus of the superior semicircular canal is much narrowed by the deposit of osseous substance in the canal's middle wall, the width of the canal thus receiving a laterally bent direction. The osseous sub-

stance deposited in both canals does not differ in appearance or consistency from the surrounding bone.

NO. 34 AND 35.

Pupil No. 59. Niels Larsen. Christened August 31, in the parish of Hörby, Hjörring County. Admitted June 27, 1827. According to the clergyman's certificate, *he became deaf after an illness, when six years old*, after which his speech by degrees became indistinct; neither of the parents, nor any of their other children, were deaf-mutes; was intelligent. Died May 17, 1831, of tuberculosis.

No. 34. Left temporal bone. Membrana tympani and stapes are wanting (which is doubtless lost in preparation or afterwards).

No. 35. Right temporal bone. Membrana tympani and stapes are wanting (doubtless lost in preparation or afterwards). The condition of the two fenestræ cannot be distinctly seen, owing to the mode of preparation. The vestibule and the three semicircular canals are entirely filled by a very firm white osseous mass. The cavity of the first turning of the cochlea is filled by a firm white mass which is something between a chalky and an osseous substance.

NO. 36 AND 37.

Pupil No. 49. Rasmus Madsen, born February 5, 1815, in the parish of Feldballe, Handerst County; admitted May 6, 1825. According to the sheriff's certificate, neither of the parents, but an elder brother was a deaf-mute (and it seems to have been supposed that he himself was *born deaf*). Died August 20, 1831, of tuberculosis.

No. 36. Left temporal bone. The modiolus and lamina spiralis are wanting in the cochlea from the middle of the second turning; the first and half the second turning are present and the interior osseous structure is normal, excepting that the scala vestibuli is somewhat wider than natural, and the lamina spiralis somewhat diminished in size. The rest of the cochlea is occupied by a cavity in which, as mentioned above, the modiolus is wanting, but in which a remainder of partition wall, resembling a thin bone beam, stretches up towards the top of the cochlea. Aquæductus vestibuli wider than normal.

No. 37. Right temporal bone. Is the same as the left excepting that scala vestibuli is widened at the expense of scala tympani,

and that lamina spiralis is more rudimentary towards the end of the first 1½ turning.

NO. 38 AND 39.

Pupil No. 9. Maren Sudersdatter, born March 28, 1818, in the parish of Vistofte, Randerst County, admitted July 30, 1828. According to the clergyman's report the parents had only had one child before the birth of the deaf-mute, which child died when eight months old ; neither of the parents are deaf-mutes ; *became deaf when one and one half years old, the result of an illness.* Had morbilli whilst at the Institution. Died December 10, 1831, of meningitis.

No. 38. Left temporal bone. Membrana tympani and ossicula auditus present. The labyrinth of normal appearance.

No. 39. Right temporal bone. Membrana tympani and ossicula auditus present. An osseous mass, which in appearance and consistency does not differ from the surrounding bone, fills the following parts of the semicircular canals, viz., the middle one fourth of the posterior, and the superior from the middle and half-way down its posterior crus.

NO. 40 AND 41.

Pupil No. 35. Johanne Dorthe Nielsdatter, born January 22, 1818, in the parish of Brylle, Odense County ; admitted August 11, 1828. According to the clergyman's certificate neither of the parents are deficient in speech or hearing, but besides this deaf-mute daughter have also had a deaf-mute son ; both were, according to the parents, *born deaf*, whilst the remaining three children can hear. Died December 27, 1831, of tuberculosis.

No. 40. Left temporal bone. Membrana tympani and ossicula auditus present. The superior part (about $\frac{1}{6}$ of the canal's length) of the posterior semicircular canal is completely filled with a substance resembling both a calcareous and osseous mass, and which by its color and softer consistency is easily discernible from the surrounding bone.

No. 41. Right temporal bone. Membrana tympani and ossicula auditus present. No abnormities in the labyrinth.

NO. 42 AND 43.

Pupil No. 24. Reder Jörgensen, born in the parish of Paarup, Odense County ; christened September 20, 1815 ; admitted

September 15, 1825. According to the certificate of two men in the parish, he was not born deaf, but *lost his hearing during an illness when five and one half years old.* Neither of the parents were deaf-mutes. Died January 3, 1832, of tuberculosis.

No. 42. Left temporal bone. Membrana tympani and ossicula auditus wanting (according to catalogue, destroyed by caries), which disease is also mentioned in post-mortem as having been present in the tympanum (Mackeprang: *Traces of caries in cavum tympani*). The labyrinthal wall of the tympanum unrecognizable on account of flat osseous deposits; fenestra ovalis closed by an osseous mass. The entrance to antrum mastoideum closed. The following semicircular canals are filled with a hard, white osseous substance which, without any sharp boundary line, becomes part of the compact osseous mass of which the petrous bone is built, viz.: the entire superior canal, with the exception of a small portion in the upper part of crus anterior, close to the middle of the canal, thus forming a cavity of the size of a pin's head; the entire external canal, which has, according to the catalogue, an abnormal curve (preparation?); the upper half of the anterior canal, with the exception of a small portion, which is perfectly open, thus forming a cavity of the size of a largish pin's head. Only traces of the vestibule are visible in the form of a small round cavity. The petrous bone is very firm and hard. Aquæductus vestibuli wider than normal.

No. 43. Right temporal bone. Traces of caries were visible in the tympanum on post-mortem. Membrana tympani and ossicula auditus are wanting (destroyed by the above-mentioned carious process, according to the catalogue). Otherwise nothing abnormal.

NO. 44 AND 45.

Pupil No. 6. Ane Dorthe Jacobsdatter, born in the parish of Lennaa, Skanderborg County; christened June 30, 1816; admitted July 20, 1825. According to the clergyman's certificate *could speak until her fifth year, when she became dumb as the result of measles.* Neither of the parents, nor any of the other children, were deaf-mutes. Died March 18, 1882, of tuberculosis.

No. 44. Left temporal bone. Membrana tympani wanting (removed in preparation?); ossicula auditus present; walls of the tympanum normal, excepting that the fenestra rotunda is closed in its depth by an osseous mass, which does not differ in

construction from the surrounding bone. The state of the vestibule cannot be decided, owing to the mode of preparation.

No. 45. Right temporal bone. The same as left.

NO. 46 AND 47.

Pupil No. 5. Ane Kristine Andersdatter, born July 17, 1817, in the parish of Veilly, Vejle County; admitted August 22, 1822. According to the clergyman's certificate the parents declare that *she became deaf when six months old, the result of convulsions due to teething*, owing to which deafness she had always been dumb. Neither of the parents have suffered from deafness. The child was remarkably intelligent. Died July 6, 1832, of tuberculosis.

No. 46. Left temporal bone. Membrana tympani wanting (doubtless the result of preparation). Ossicula tympani present. Superior and anterior semicircular canals filled in their middle thirds by an osseous mass; the external canal is narrowed in the middle corresponding to $\frac{2}{3}$ of its extent.

No. 47. Right temporal bone. The same abnormities, but the external canal is less narrowed.

NO. 48 AND 49.

Pupil No. 12. Ingeborg Andestatter. Born July 4, 1818, in the parish of Hŭrŭp, Thisted County. Admitted August 26, 1827. The father stated in a written declaration that in February, 1825, *the child (then 6½ years old)* after going out in a severe storm *became suddenly ill with headache and violent vomitings* in which worms were thrown up. Became *unconscious* after three days' violent pain; consciousness returned on the fourth, but fourteen days elapsed before she could walk. *The power of hearing was lost.* Blisters were applied, but to no purpose, as the patient tore them off; warm milk was also syringed into the ears to no avail. Speech imperfect, but remembers written letters and can thus be taught to pronounce. None of her family are deaf-mutes. Died May 18, 1823, of tuberculosis.

No. 48. Left temporal bone. Membrana tympani wanting (lost in preparation), stapes wanting (from the same reason); both fenestræ present and normal in appearance, both leading to the same small cavity, which cannot be more closely examined on account of the mode of preparation, but which is doubtless the vestibule, or its remains. All the semicircular canals and the cochlea are filled with a firm, white, osseous mass, which does not

differ from the surrounding bone, either in appearance or consistency ; the cochlea is chiselled out as a round solid projection.

No. 49. Right temporal bone. The same as left, excepting that membrana tympani and stapes are present.

NO. 50 AND 51.

Pupil No. 37. Maren Nielsdatter. Born March 14, 1817, in the parish of Dover, Skanderborg County. Admitted August 29, 1828. None of her family were deaf-mutes ; according to the clergyman's certificate, *she is supposed to have lost her hearing in early childhood.* Had scarlatina whilst in the Institution. Died October 19, 1833, of tuberculosis.

No. 50. Left temporal bone. Membrana tympani missing (probably the result of preparation); the ossicula auditus present. Normal.

No. 51. Right temporal bone. Membrana tympani wanting (probably the result of preparation); crus longum incudis wanting ; stapes wanting.

NO. 52 AND 53.

Pupil No. 35. Marie Olivia Elizabeth Larsdatter. Born April 17, 1827, in the parish of Hellebach, Fredericksborg County. Admitted October 1, 1835. Must be considered as *born deaf* according to the clergyman and doctor's certificates. Neither of the parents deaf-mute ; an elder brother still living is deaf-mute, as was also an elder brother who died in the Institution and whose temporal bones form specimens No. 24 and 25. Died May 8, 1837, of tuberculosis.

No. 52. Left temporal bone. Membrana tympani and ossicula auditus present. The modiolus and lamina spiralis cease entirely in the middle of the second turning, and the partition wall between the second and third turnings is wanting, the result being the formation of a large cavity in the top of the cochlea ; whilst its base is occupied by the whole first and half of the second turning, the interior osseous structure of which is normal. Acquæductus vestibuli much wider than normal. (The catalogue remarks : "This preparation was not a success.")

No. 53. Right temporal bone. Membrana tympani wanting, (doubtless removed in preparation); ossicula auditus present. The condition of the cochlea the same as in left side, with the addition of the following abnormities: scala vestibuli in the

existing parts of the cochlea much wider than usually; in the large cavity in the top of the cochlea is a narrow beam, which proceeds slantingly from the upper part of the remaining modiolus to the interior surface of the cochlea; this beam is probably the remains of the ruined partition wall.

NO. 54 AND 55.

Pupil No. 22. Louisa Augusta Danielsen. Born in Copenhagen, June 5, 1814. Admitted October 1, 1823. Was, according to her doctor's certificate, *born deaf*. Died June 7, 1824, of tuberculosis.

No. 54. Left temporal bone. Normal.[1]

No. 55. Right temporal bone. Normal.

NO. 56 AND 57.

Pupil No. 41. Anders Nielsen. Born December 3, 1815, in the parish of Visby, Thisted County. Admitted June 11, 1824. *Born deaf*, according to certificate from the county authorities; no attempt made to cure him. Died May 25, 1826, of tuberculosis.

No. 56. Left temporal bone. Normal.

No. 57. Right temporal bone. Normal.

(The partition wall in the upper part of the cochlea is, however, wanting, thus forming a large cavity; but as neither Mackeprang nor the Museum Catalogue mention this abnormity, it is presumably owing to preparation.)

NO. 58 AND 59.

Pupil No. 13. Margrethe Larsdatter. Born 1811, in the parish of Gundsleo, Maribo County. Admitted July, 1820. *No information as to cause of deafness.* Died 1826, of tuberculosis.

No. 58. Left temporal bone. Normal.

No. 59. Right temporal bone. Not prepared.

NO. 60 AND 61.

Pupil No. 18. Carl Frederick Eegholm. Born April 14, 1819, in Branders. Admitted April 6, 1827. *Born deaf*, ac-

[1] This remark, here and in the following, is made use of even when examination shows the membrana tympani or ossicula auditus to be wanting, but where it is probable that this was the result of preparation, as Mackeprang in his reports says that there was no abnormity in the temporal bones, which statement is repeated in the Catalogue.

cording to certificate from the dean of the county. None of his family are deaf-mutes. Had morbilli whilst in the Institution. Died March 6, 1829, of tuberculosis.

No. 60 and 61. Both temporal bones. Normal.

NO. 62 AND 63.

Pupil No. 63. Anders Pedersen. Born in the parish of Rödding, Viborg County; christened November 16, 1816. Admitted August 10, 1827. *Born deaf*, according to certificate signed by two men living in the parish. Neither of the parents nor their other children deaf-mutes; a brother very deaf with a difficulty of speech. Died March 24, 1829, of tuberculosis of the brain.

No. 62 and 63. Both temporal bones. Normal.

NO. 64 AND 65.

Pupil No. 18. Mine Fransine Jensen. Born 1813, in the parish of Gjentofte, Copenhagen County. Admitted 1821. *No information as to cause of deafness.* Had morbilli whilst in the Institution. Died July 6, 1829, of tuberculosis.

No. 64 and 65. Both temporal bones. Normal.

NO. 66 AND 67.

Pupil No. 39. Nette Johanne Kundsdatter Quist. Christened March 29, 1818, in the parish of Olsted, Vejle County. Admitted September 14, 1828. *No information as to cause of deafness*, the parents leading a roving life. Died January 18, 1830, of tuberculosis.

No. 66 and 67. Both temporal bones. Normal.

NO. 68 AND 69.

Pupil No. 27. Christian Hansen Fjeldsted. Born July 12th, in Copenhagen. Admitted October 1, 1823. *No information as to cause of deafness.* Died March 16, 1830, of tuberculosis.

No. 68 and 69. Both temporal bones. Normal.

NO. 70 AND 71.

Pupil No. 32. Ane Hansdatter. Born December 8, 1816, in the parish of Aadum, Ringkjobing County. Admitted September

13, 1827. According to clergyman's certificate, is said by parents to have been *born deaf*. None of her family are deaf-mutes. Had morbilli whilst in the Institution. Died March 31st, of tuberculosis.

No. 70 and 71. Both temporal bones. Normal.

NO. 72 AND 73.

Pupil No. 57. Jörgen Andersen. Born April 1, 1815, in the parish of St. Jörgen, Svendborg. The clergyman of his parish states that the boy *could hear until six years old, when he lost his hearing and his left eye in morbilli* (the father says scarlatina), and has since been delicate ; by degrees lost the power of speech ; his brother has endeavored to teach him to spell, to no purpose. Otherwise in enjoyment of his intellectual faculties. He has a twin sister who can hear. Died May 5, 1830, of tuberculosis.

No. 72 and 73. Both temporal bones. Normal.

NO. 74 AND 75.

Pupil No. 2. Frederick Emil Engelbrechtsen. Born May 5, 1820, in the parish of Copenhagen. Admitted April 30, 1827. The brother declares him to have been *born deaf*, but the defect was first discovered when he was one and one half years old. Had morbilli whilst in the Institution. Died June 19, 1830, of tuberculosis.

No 74 and 75. Both temporal bones. Normal.

NO. 76 AND 77.

Pupil No. 52. Anders Nielsen. Born 1816, in the parish of Vargod, Ringkjobing County. Admitted June 22, 1825. *Born deaf*, according to clergyman's certificate. The parents have three younger children, neither of whom, nor the parents, are deaf-mutes. Had tussis convulsiva and morbilli whilst in the Institution. Died September 7, 1830, of tuberculosis.

No. 76 and 77. Both temporal bones. Normal.

NO. 78 AND 79.

Pupil No. 15. Kirstine Marie Jensdatter. Born March 10, 1820, in the parish of Webber, Aalborg County. Admitted, September 14, 1829. The parents declare her to have been *born deaf*.

Neither of the parents, nor their other children, are deaf-mutes. Died January 15, 1831, of tuberculosis of the brain.

No. 78 and 79. Both temporal bones. Normal.

NO. 80 AND 81.

Pupil No. 45. Karen Rasmusdatter. Born March 8, 1819, in the parish of Dannemarre, Maribo County. Admitted, May 9, 1829. *Born deaf*, according to the clergyman's certificate, the same being the case with a brother three years younger. Neither of the parents deaf-mute. Died January 29, 1831, of tuberculosis.

No. 80 and 81. Both temporal bones. Normal.

NO. 82 AND 83.

Pupil No. 11. Ane Hansdatter. Born November 24, 1817, in the parish of Nordby, in the island of Fano. Admitted May, 1827. The mother declared the child to have been *born deaf*, as it had never been able to speak and never had any illness. Neither of the parents, nor their two elder sons, were deaf-mutes. Had morbilli whilst in the Institution. Died March 3, 1831, of tuberculosis.

No. 82 and 83. Both temporal bones. Normal.

NO. 84 AND 85.

Pupil No. 40. Kirstine Sörensdatter. Born in the parish of Thyrsted, Vejle County; christened March 11, 1818; admitted September 25, 1828. *Born deaf*, according to clergyman's certificate. Died March 17, 1831, of tuberculosis.

No. 84 and 85. Both temporal bones. Normal.

NO. 86 AND 87.

Pupil No. 41. Ellen Larsdatter. Born November 20, 1819, in the parish of Egebjerg, Holbæk County; admitted November 4, 1828. *Born deaf*, according to clergyman's certificate. Neither of the parents deaf-mute. A younger brother born deaf. A younger sister speaks and hears deficiently; might be said to be a deaf-mute. Had morbilli whilst in the Institution. Died March 28, 1831, of tuberculosis.

No. 86 and 87. Both temporal bones. Normal.

NO. 88 AND 89.

Pupil No. 2. Kund Jörgensen. Born September 25, 1822, in the parish of Ostrup, Odense County. Admitted July 1, 1830. *Born deaf*, according to clergyman's certificate, and can only hear shouting into the ear. The parents have had a deaf-born daughter since the son's admission to the Institution. Died April 9, 1831, of tuberculosis.

No. 88 and 89. Both temporal bones. Normal.

NO. 90 AND 91.

Pupil No. 51. Wilhelm Valdemar Thomassen. Born November 13, 1816, in Slagelse. Admitted June 3, 1825. *Born deaf*, according to sheriff's certificate. No other member of the family deaf-mute. Died October 28, 1813, of tuberculosis.

No. 90 and 91. Both temporal bones. Normal.

NO. 92 AND 93.

Pupil No. 3. Jens Jensen. Born, September 14, 1821, in the parish of Skambz, Odense County. Admitted July 1, 1830. According to the clergyman's certificate, the mother declares the child to be *born deaf*. No other member of the family deaf-mute. Died, December 14, 1821, of tuberculosis.

No. 92 and 93. Both temporal bones. Normal.

NO. 94 AND 95.

Pupil No. 32. Christen Clausen. Born June 7, 1817, in the parish of Hohnstrup, Holbæk County. Admitted February 19, 1827. The clergyman's certificate declares him to have *become deaf during an illness in his 2d year*. Had morbilli whilst at the Institution. Died February 20, 1832, of tuberculosis.

No. 94 and 95. Both temporal bones. Normal.

NO. 96 AND 97.

Pupil No. 3. Magdalene Nielsdatter. Born September 16, 1816, in the parish of Förslov, Sorö County. Admitted July 11, 1825. *Born deaf*, according to clergyman's certificate. Neither of the parents, or their other children, deaf-mute. Had morbilli whilst in the Institution. Died April 12, 1832, of tuberculosis.

No. 96 and 97. Both temporal bones. Normal.

NO. 98 AND 99.

Pupil No. 2. Jens Christian Pedersen. Born May 19, 1823, in the parish of Hore, Ringkjöbing County. Admitted July 3, 1831. *Born deaf;* three deaf-mute brothers and sisters. Neither of the parents deaf-mute. Died July 13, 1832, of meningitis.

No. 98 and 99. Both temporal bones. Normal.

NO. 100 AND 101.

Pupil No. 36. Ane Margrethe Nielsdatter. Born December 10, 1819, in the parish of Magletz, Svendborg. Admitted August 28, 1828. *Born deaf*, according to clergyman's certificate. The parents have seven children, of whom four are deaf-mutes; no other deaf-mutes in the family. Died November 23, 1832, of tuberculosis.

No. 100 and 101. Both temporal bones. Normal.

NO. 102 AND 103.

Pupil No. 20. Ane Christiansdatter. Born February 11, 1820, in the parish of Mörke, Holbæk County. Admitted July 31, 1828. The parents declare her to have been *born deaf*. No other members of the family deaf-mute. Had morbilli whilst in the Institution. Died June 9, 1833, of tuberculosis.

No. 102 and 103. Both temporal bones. Normal.

NO. 104 AND 105.

Pupil No. 8. Ane Marie Madsdatter. Born in the parish of Skarrild, Ringkjöbing. Christened September 7, 1819. Admitted April 21, 1829. The parents believe her to have been *born deaf*. No other members of the family deaf-mute. Had measles shortly before admission to the Institution. Died August 1, 1833, of tuberculosis.

No. 104 and 105. Both temporal bones. Normal.

NO. 106 AND 107.

Pupil No. 37. Lars Jensen. Born May 22, 1822, in the parish of Greensing, Ringkjöbing County. Admitted October 7, 1833. *Born deaf*, according to clergyman's certificate, but could hear slightly and speak, though only a few monosyllabic words. No other members of the family deaf-mute. Died March 3, 1834, of tuberculosis.

No. 106 and 107. Both temporal bones. Normal.

NO. 108 AND 109.

Pupil No. 16. Steinvor Thordursdatter. Born August 26, 1821, in Iceland. Admitted November 10, 1829. According to certificate from the judge of the district, *became deaf when six months old, the result of an illness*, which is described as causing black spots on the skin, which ulcerated, the illness lasted seven weeks, and was cured without medical assistance. None of the family deaf-mutes. Died July 24, 1834, of tuberculosis.

No. 108 and 109. Both temporal bones. Normal.

NO. 110 AND 111.

Pupil No. 7. Hans Mortensen. Born February 16, 1824, in the parish of Brobz, Odense County. Admitted September 29, 1833. *Born deaf*, according to clergyman's certificate. No other members of the family deaf-mute. Died December 17, 1834, of nephritis during scarlatina.

No. 110 and 111. Both temporal bones. Normal.

NO. 112 AND 113.

Pupil No. 6. Jacob Hansen. Born February 26, 1823, in the parish of Braalg, Sorö. Admitted September 27, 1833. According to schoolmaster's certificate, *became deaf when three years old, the result of scarlatina.* The mother somewhat deaf, but no deaf-mutes in the family. Has some slight hearing, but cannot speak distinctly. Died January 20, 1836, of tuberculosis.

No. 112 and 113. Both temporal bones. Normal.

NO. 114 AND 115.

Pupil No. 31. Hans Mogensen. Born August 24, 1824, in the parish of Faareveile, Holbæk County. Admitted October 1, 1833. *Born deaf*, according to clergyman's certificate. None of the family deaf-mute, but the father deaf, the result of a blow received in childhood. Died May 12, 1836, of tuberculosis.

No. 114 and 115.[1] Both temporal bones. Normal.

NO. 116 AND 117.

Pupil No. 42. Ole Jörgensen. Born May 31, 1826, in the parish of Grönholt, Fredericksborg County. Admitted October 1, 1834,

[1] At the margin of the Catalogue it is added that the ossicula are wanting; the specimen is somewhat damaged.

Born deaf, according to clergyman's certificate. None of the family deaf-mute, so far as is known. Died February 21, 1837, of tuberculosis.

No. 116 and 117.[1] Both temporal bones. Normal.

NO. 118 AND 119.

Pupil No. 22. Karen Marie Pedersdatter. Born December 9, 1824, in the parish of Skaelbz, Praestö County. Admitted November 1, 1834. According to certificate from the principal medical officer of the district, *he became deaf in his fourth year, after an illness.* No other deaf-mutes in his family. Died March 16, 1837, of inflammation of the brain.

No. 118 and 119. Both temporal bones. Normal.

On examining this large collection of preparations of the temporal bones of deaf-mutes, the following results seem worthy of mention. First, the osseous parts of the auditory organs in more than one half of the cases are not the seat of any abnormity that could be pointed out. This is still more remarkable, when we consider that the abnormities discovered in some cases cannot be supposed to have influenced the hearing of the deaf-mute in question to any important extent (specimens 14 and 15, 20 and 21), or have existed only on the one side (Nos. 19, 33, 35, 39, 40 and 51). Our present knowledge of the morbid anatomy of deaf-mutism leads us to suppose that the above is owing to too much attention having been paid to the osseous parts, and too little to the membranous parts. The examination of the latter has been without doubt deficient, as Mackeprang does not, in a single case, mention the presence of such anomalies, for instance, atrophy or degeneration of the auditory nerve, absence or other abnormity of the membranous labyrinth, or ankylosis of the stapes is nowhere mentioned, although these anomalies are by no means rare in deaf-mutes. The negative result thus arrived at in a number of cases is particularly frequent in cases concerning deaf-mutes reported as having been born deaf, the temporal bones in 25 out of 33 such cases, *i. e.*, about three-fourths of

[1] At the margin of the Catalogue it is added that the ossicula are wanting; the specimen is somewhat damaged.

the whole, exhibiting nothing abnormal on either side, while this was the case only with 4 couples of specimens out of 14 concerning acquired deaf-mutism. The negative result obtained from the examination of the temporal bones of *deaf-born* deaf-mutes is doubtless in accordance with the circumstance, that congenital anomalies in the organs of hearing of deaf-mutes are much less marked, both as to the extent and severity of the primary processes, than the acquired. It is also in connection with the above that in 10 out of 14 cases of acquired deaf-mutism, the pathological changes discovered have been the result of much more extensive and intense processes, than in cases of congenital deafness.

As far as the nature of the abnormities is concerned, it will be seen that the morbid changes found in the deaf-born are only exceptionally the expression of malformations—or deformities caused by arrest of development (Nos. 14-15, and 22-23), but in the majority of cases they can be explained as the result of fœtal inflammatory processes, which have caused a partial destruction of the internal osseous structure of the labyrinth, and in many cases the consequent formation of osseous tissue. The comparatively frequent abnormity, consisting in the destruction of the upper turns of the cochlea, thus causing a large cavity in the top of that organ without the normal osseous contents, or with smaller or larger remains of the same, whilst the lower parts of the cochlea (which has a more substantial modiolus to support itself), completely or almost completely preserved, is a probable result of a destructive fœtal inflammatory process (Nos. 12-13, 24-25, 28-29, 36-37, 52-53). In two cases this abnormity was of peculiar interest, as the four specimens belonged to a deaf-mute brother and sister (Nos. 24-25 and 52-53).

Specimens Nos. 30-31 and 40 can be mentioned as examples of how fœtal inflammatory processes form the basis of a new formation of osseous tissue following upon the destruction of the interior of the labyrinth. No doubt it may be objected, that the perfect resemblance of the pathological products found in this small number of cases, to those

found in many cases of acquired deafness, speaks more in favor of a post-fœtal origin, and that consequently it is more probable that the information concerning the history of the deaf-born deaf-mutes in question was incorrect. However, numerous other post-mortems of deaf-born deaf-mutes prove that the appearance of the formation of osseous tissue, more or less completely filling the labyrinth, is frequently found in the deaf-born, the pathological changes in whose auditory organs often strongly resemble those found in cases of acquired deaf-mutism.

Finally, the examination of these temporal bones of deaf-mutes, whose deafness was acquired after birth, proves that the pathological changes with preponderating frequency consisted in the deposit of osseous matter in the normal cavities of the labyrinth. This deposit was in most cases confined to a single division of the internal ear, and most frequently to one or more semicircular canals; in a few cases it occupied two of the three divisions of the labyrinth, and in a single case all three (No. 16-17). Even when the osseous mass was found in only a single of the three sections of the labyrinth, it was generally only present in parts of that section, sometimes only narrowing the normal cavity, sometimes closing it more or less completely. The osseous mass closing the cavity was often not to be distinguished from the surrounding bone of the pars petrosa either in color or consistency, whilst in some cases it was clearly distinguishable, owing partly to its greater whiteness, partly to its firmer, more ivory-like consistency, and in a few cases to its chalky consistency and color (specimens Nos. 35 and 40). Closely related to the described osseous new formation is the actual chalky substance found in some of the cases, which, as well as the osseous mass, must be undoubtedly considered as the result of infantile otitis intima. In two cases of acquired deafness (Nos. 32-33 and 44-45) the cause is said to have been measles, which, as we know, can produce acute disease of the labyrinth; the history of the other cases, where the deafness was acquired, was not very clear. In only one case (No. 48-49) were the symptoms undoubtedly those of meningitis, which disease is an important cause of

otitis intima in childhood, in which case a new osseous structure is often formed in the labyrinth, as has been proved by several more recent post-mortems of deaf-mutes, and of persons who had become deaf after this disease, especially in its epidemic form.

Although this little survey has only touched on the most important results of an examination of the specimens of temporal bones in the Pathological Museum of the Copenhagen University, it must, I think, be evident that this collection affords a valuable contribution to the morbid anatomy of deaf-mutism, and of ear-disease, in particular labyrinthine disease. It will, therefore, always form one of the ornaments of the Copenhagen University's Pathological Museum, and be a lasting monument to the industry and skill of those to whom it owes its existence.

HYPERTROPHIC CONDITION OF THE TYMPANIC MUCOUS MEMBRANE IN AN INFANT.

By ARTHUR H. CHEATLE, F.R.C.S. London.

(*With one drawing.*)

A FEMALE child aged eight months was brought in dead to King's College Hospital; death being due, according to the mother's account, to an attack of croup.

On examining the ears, both membranes were found to be intact but bulged outwards by a sero-mucous-looking exudation, and the mucous membrane which was seen through this mass appeared to be of a dull dark-red color. On opening the middle ears from above and removing the yellow viscid material contained therein, the lining mucous membrane on both sides, but more especially on the left, was seen to be much thickened and papillated, completely filling up the cavities, clogging the ossicles, and blocking up the fenestræ; over the membranes the papillary condition was replaced by minute, discrete elevations; several small circular red masses about half the size of a pin's head were found free in the cavities.

Under the microscope, the exudation contained many cast-off epithelial cells. Sections of the mucous membrane showed that the submucous tissue immediately below the lining epithelium was simply a mass of young granulation tissue, *B* (numerous and closely packed small round cells with newly formed vessels amongst them); the lining epithelium remaining in many places intact, *C*; the deeper layer, *A*, retaining its fibrous appearance with small round cells scattered throughout. Sections of one of the small

circular masses showed it to be composed of very vascular granulation tissue, broken at one point, where it had evidently been attached, and devoid of any epithelial lining.

FIG. I.

Transverse Section of the Hypertrophied Mucous Membrane. × 50 diam.

The naso-pharynx was in a slightly granular condition, as was also the upper surface of the soft palate; the rest of the pharynx and soft palate were perfectly normal. The lungs were rather congested, the mesenteric glands were large, Peyer's patches and the solitary glands also enlarged.

The child was markedly rachitic but fairly nourished. No history of tubercle or syphilis could be obtained.

The case appears to have been one of early hypertrophic catarrh commencing *de novo* in the ears, as the condition of the naso-pharynx was comparatively healthy; if all the new tissues had subsequently become organized and contracted, complete deafness and deaf-mutism must have resulted.

For permission to publish this case and for the post-mortem report I am indebted to Professor Norman Dalton.

THE PATHOLOGY OF DEAF-MUTISM.

By JAMES KERR LOVE, M.D., Glasgow.

IN a former paper[1] I have entered with some detail into the question of the hearing power of the 175 children examined by me at the Institution for the Deaf and Dumb at Glasgow, and I now propose to refer to the etiology of the condition; a subject the study of which appears to have been much neglected in Great Britain.

From the admission-schedules of these children we find that the causes of the deafness are thus defined:

Adventitious or acquired	in	81 cases
Congenital	"	72 "
Doubtful	"	22 "

from which it appears that the acquired are more numerous than the congenital cases; this is not in accordance with most statements, but as these are not checked by personal examination they are of little value. I believe with Roosa[2] that whenever personal examination by an expert is responsible for the figures, the acquired cases will be found to be more numerous than the congenital.

Of these 175 children, nine were totally deaf, but we find that only two had been rendered so by disease, while seven had been born deaf. On the other hand, among those who distinguish the voice, twenty out of thirty have been made deaf by disease while ten have been born deaf. Taken as a class, then, "congenital" deaf-mutes are deafer than "acquired" deaf-mutes. I notice this point chiefly because Hartmann[3] states that the opposite is the case.

---

[1] These Archives, vol. xxii., p. 170.
[2] These Archives, vol. xiii., p. 67.
[3] *Deaf-mutism.* Translation by Cassell's, p. 87.

The hearing power in congenital and acquired deaf-mutes is shown in the following table:

TABLE I.

	Acquired Deafness.	Congenital Deafness.	Doubtful.	Total.
Totally deaf	2	7	—	9
Heard loud noises	36	32	13	81
Distinguished voices	20	10	3	33
Too young for testing	21	22	6	49
Dumb but not deaf	2	1	—	3
	81	72	22	175

With regard to the cases of acquired deaf-mutism, the following are the causes upon which the condition is said to depend:

Meningitis and brain fever	13
Convulsions, fits, and teething	7
Falls and injuries to the head	11
Measles	10
Scarlet fever	3
Whooping cough	1
Other fevers	3
Ear affections proper [suppurative affections]	8
Syphilis	2
Cold	2
Inflammation of the lungs	1
Fright	1
Unknown or unspecified causes	19
	81

In comparing this list with most of those previously published, I have to notice particularly the absence of typhus and cerebro-spinal meningitis. In Hartmann's tables these two diseases rank next to cerebral inflammation as causes of deaf-mutism. In the American table quoted in the *Royal Commission Report*, neither of them are specially mentioned, but in Roosa's table of 147 acquired and congenital cases,

cerebro-spinal meningitis accounts for forty-seven! Typhus is now a rare disease in Great Britian, and with reference to cerebro-spinal meningitis in the epidemic form, Fagge[1] says: "Scotland, I believe, has been altogether spared by it." The absence of these diseases as causes of deaf-mutism in the west of Scotland is, therefore, not a matter of astonishment. In nearly all statistics, scarlet fever occupies a much more important place than in the above list, and I have no doubt that in this respect my figures are exceptional. In other respects the list represents fairly well the etiology of acquired deaf-mutism.

After deducting the cases due to unknown causes, we have sixty-two in which the cause is definitely stated, and of these twenty, or nearly a third, are cerebral inflammation, convulsions, and fits. If to these we add eleven cases due to injury to the head by falls, etc., we have exactly half of the cases of acquired deaf-mutism for which any cause is given, due to primary mischief in the brain or internal ear, without concomitant disease in the middle or external ear. Some of these may be cases of meningitis in which the mischief has spread to the auditory nerve and its expansion in the internal ear, but I think that meningitis is made to figure too prominently as a cause of deaf-mutism. Some of these cases are probably cases of primary labyrinthitis ending in total or partial destruction of the internal ear, without any brain affection whatever. In children, and even in adults, primary labyrinthitis undoubtedly occurs,[2] and some of our cases of recovery from apparent meningitis may be thus explained.

Measles accounts for ten of the sixty-two cases. If an additional reason were needed for the compulsory notification of this disease to local authorities, I think it may be found in these statistics of deaf-mutism. Scarlet fever would appear to be less destructive to the hearing of young children in Scotland than measles. This conclusion is contrary to the evidence of both American and German statistics, and for its qualification I append a statement of the concurrence

---

[1] *Principles and Practice of Medicine*, vol. i., p. 691.

[2] Gruber, *Diseases of the Ear*, Law and Jewell's translation, pp. 515 to 525.

of infectious diseases amongst the children before their admission to the Institution:

Measles	.	.	.	.	.	in	91	of the cases
Whooping cough	.	.	.		"	81	"	" "
Scarlet fever	.	.	.	.	"	31	"	" "
Small-pox	.	.	.	.	"	5	"	" "
Diphtheria	.	.	.	.	"	1	"	" "
Typhoid fever	.	.	.		"	1	"	" "

This statement of the occurrence of infectious diseases amongst young deaf-mutes is incomplete, as the schedules sometimes give no information at all, but measles appear to attack them about three times as often as scarlet fever, and it also accounts, as is shown in the previous list, for fully three times the number of deaf-mutes.

How these diseases act in producing the higher degrees of deafness it is not always easy to say, but there is very decided evidence to show that the labyrinthine affection in measles is in many cases secondary to the middle-ear affection. Mygind [1] of Copenhagen has described a case in which this was almost certainly the order of events. Moos [2] has described a similar case and has shown the part played by the micro-organisms in the invasion of the labyrinth. On the other hand, some of my cases point to the invasion of the labyrinth without the intervention of disease of the middle ear. Four of the ten cases in the above list show normal membrana tympani.

Hartmann appears to consider that the deaf-mutism which follows scarlet fever is always caused by a primary affection of the labyrinth, and he states that in nearly all cases of deaf-mutism where this disease has been the cause, he has found normal membranes. In six of my ten cases of measles the membrane was either perforated or otherwise distinctly abnormal, and in only one of the three cases of scarlet fever was it normal. Further, cases have just been published which show that the inflammation in scarlet fever may spread from the middle ear to the labyrinth and may totally obliterate and destroy that organ.[3] It may be true that when

[1] These ARCHIVES, vol. xx., p. 310.
[2] These ARCHIVES, vol. xviii., p. 49.
[3] Mygind, These ARCHIVES, vol. xxii., p. 17; Moos, p. 64.

we look at all the otorrhœa due to scarlet fever, the percentage ending in deaf-mutism is small, but of the cases of deaf-mutism due to scarlet fever probably a large number depend upon labyrinthine disease due to infection from middle-ear inflammation.

That class of cases described as ear disease proper may be taken as being composed of cases of suppurative median otitis producing deafness in most instances by spreading of the mischief to the internal ear. In two at least of the cases the damage to the middle ear was very extensive. I removed a sequestrum from one ear of one of these children at the Institution, while I performed the same operation for the other child in one of the wards of the Royal Infirmary. In another of these cases suppurative inflammation was going on actively at the time of the examination. The class consists of eight cases, and in most, if not in all, we may assume that the cause of deafness is middle-ear suppuration, unaccompanied at its outset with scarlet fever, measles, or other general complaint. The ravages of suppurative middle-ear disease were seen in a much larger number of cases, but probably the disease in these cases set in after the occurrence of the deafness.

The work of inspection presented two difficulties:

1. The removal of obstacles from the external auditory canal.

2. The fixing of a standard of normal appearance for the tympanic membrane.

Thirty-seven children had their ears plugged with cerumen or a foreign body. The latter consisted of pebbles, a bead, bits of wood, and pieces of cotton wadding. All these were removed, and all the masses of cerumen except those in two cases were also removed; these two children left the Institution before the operation could be done for them.

It is almost impossible to fix a standard for the appearance of the healthy tympanic membrane. Normal hearing is consistent with great variety in the appearances. Politzer[1] found only twenty-five per cent. of normal membranes amongst normal hearing individuals. In Roosa's[2] examina-

[1] Ocularinspection des Trommelfells. *Wien. Wochenblatt*, 18, 1862.
[2] These ARCHIVES, vol. xiii., pp. 65–68.

tions of the ears of deaf-mutes, very little at all is admitted as normal. Roosa and Beard, in their short account of the examination of the ears of deaf-mutes, say: "We consider a normal membrane to be a translucent pearly-gray membrane with the head and handle of the malleus distinct, not very prominent however, or projecting much above the plane of the membrane. On the lower segment is a reflection of the light of a general triangular shape, its apex resting on the lower extremity of the handle of the malleus. The angle formed by the membrane with the upper wall of the external auditory canal is 140 degrees." [1] Now in children the membrane exhibits, in cases of normal hearing, even greater variety than in adults, so that the setting up of any rigid standard like the above is not likely to lead to any valuable results. One gets accustomed to associate certain appearances with certain diseased conditions, and a large clinical experience gives a wider and truer idea of what is normal or abnormal than the application of any rigid standard. In examining these cases, therefore, I applied no absolute standard to the membrane. All perforations, all marked opacities, and all very distinct alterations in thickness, in color, or in curve were considered abnormal. But a membrane was not called abnormal merely because the cone of light varied a little from the triangular, or because the malleus was slightly more prominent than my idea of the strictly normal. Again, the distinction between the remains of suppurative and non-suppurative lesions cannot always be rigidly drawn, but all perforations, cicatrices, and pronounced calcareous changes were put down as due to suppurative diseases.

Both membranes were always examined, and both ears tested. But the testing of the ears separately by the tuning-fork on the forehead and mastoids has not given such definite results in my hands as in Roosa's. The statements of a deaf-mute about his sensations when the handle of a tuning-fork is vibrating on his forehead should be received with the greatest caution. None but the most intelligent deaf-mutes understand the nature of a relative test like this,

[1] *American Journal of Medical Sciences*, April, 1867.

so that while in the journal of the cases I have notes of all of the conduction experiments, I hesitate to produce them here, or to found upon them any absolute conclusions as to the location of the lesion causing the deafness. For the same reason, and to simplify these statistics, I represent the membrane as either normal or abnormal; the occurrence, say, of a perforation in one, places that case among the abnormal, although the other membrane be intact. "Membrane normal," therefore, means that there is no marked pathological appearance on either side.

TABLE II.

	Acquired Deafness.	Congenital Deafness.	Doubtful.	Total.
Membranes normal.....	28	26	7	61
Suppurative otitis media, active or extinct.....	18	11	3	32
Changes indicating non-suppurative catarrh.....	34	33	11	78
Unexamined	1	–	1	2
Meatus too narrow for examination.	–	2	–	2
	81	72	22	175

TABLE III.

	Meningitis and Brain Affections.	Falls and Head Injuries.	Measles.	Scarlet Fever.	Ear Affections Proper.
Membranes normal....	10	5	4	1	–
Suppurative lesions....	2	1	4	1	4
Non-suppurative lesions	7	5	2	1	4
Unexamined.....	1	–	–	–	–
	20	11	10	3	8

NOTE.—This table should be read in connection with the remarks made upon the various causes of acquired deafness in the earlier part of this paper.

When we compare the appearances (Table II.) in acquired and congenital deafness, the contrast is less striking than

we expect. There are almost as many normal membranes in acquired as in congenital deafness. There is greater destruction of the membrane from suppurative disease amongst the acquired cases, but even here the contrast is not a strong one. In-drawing and other non-suppurative changes are commoner to a slight extent in the congenital cases, but there is an absence of characteristic lesions in parts which can be seen through the speculum.

There was no case of malformation of the auricle in the entire list of 175 cases. Two cases of extreme narrowness of the external auditory canal were found; both were cases of congenital deafness. In one, other deformities existed: these consisted of cleft palate[1] with posterior curvature of the spine and very deficient eyesight; the mouth and teeth were also markedly syphilitic. Another case of malformation, consisting of a very unusual arrangement of the fingers of one hand and the toes of one foot, with webbing between the digits, was found, but the boy had fairly wide auditory canals, through which were seen opaque, and somewhat lustreless but intact membranes. A well marked case of false membrane after suppurative disease was seen. Many of the lesions which disfigure the tympanic membranes of deaf-mutes occur subsequent to the onset of the deafness, and in this way much that is characteristic of the two classes of cases becomes obliterated. About seventy per cent. of the children showed distinct thickening of the tonsils, pharynx, or both. In about thirty-three per cent. the tonsils are described as being much thickened, or the pharynx as very distinctly altered in the direction of disease, but these latter cases are not associated with any special condition of the tympanic membrane.

Roosa and Beard's examinations tally almost exactly with my own estimates,—they found that fully two thirds of the deaf-mute children showed pharyngeal disease or enlargement of the tonsils. Has this anything to do with the production of the deafness? In most of the acquired cases I do not think it has. Most of these are fully accounted for by lesions which have set in with definite symptoms

[1] Compare Case 1 (Hyrtl), Hartmann's list. *Deaf-mutism*, p. 206.

leading up to the deafness. But over twenty per cent. of the acquired cases (19 in 81) have no cause assigned to them. The terms used in answer to the question are, "uncertain," "unknown," or "doubtful," or the information is simply withheld. Now it is noteworthy that in at least half a dozen of these cases, although the cause is stated to be "unknown," the date of the onset of the deafness is definitely stated, *e. g.*, "unknown at four years," "at three years," etc. There is here an absence of sudden onset or of striking concomitant symptoms, and deafness occurring under these conditions is suggestive of the insidious invasion of non-suppurative catarrh. It is amongst these "unknown" causes I think, that this disease plays its role in acquired deafness. But these cases do not represent all the mischief done by the disease. It is a common affection amongst the young between three and ten years of age, and young deaf-mutes cannot be freer from it than their hearing brothers and sisters. If then in a child some damage has been done to the labyrinth by accident or disease, and he be in consequence on the border of mutism, and if the condition of the naso-pharynx be favorable to the development of non-suppurative catarrh of the middle ear, his hearing may soon be damaged by this catarrh to an extent quite incompatible with the retention of speech. It is just possible too that this affection may account for some of the cases of so called congenital deaf-mutism. Any disease without striking symptoms causing deafness during the first year of life, will give rise to the impression that the case is one of congenital deafness, and we have no reason to suppose that the first year of life is free from non-suppurative catarrh of the middle ear.

A study of the anatomical conditions upon which congenital deafness depends is not within the scope of this paper. No light can be thrown on them by examinations such as the present. The absence of malformations in the external parts does not warrant a similar conclusion with regard to the labyrinth. It will be recollected that the vestibule, the semicircular canals, and the cochlea are all developed from a primary otic vesicle, after the latter has be-

come a separate and closed sac, and that the tympanic cavity, the Eustachian tube, and external canal are the remains of the first post-oral cleft. Malformation or arrest of development may go on quite independently in these two regions, and if we are to judge from the reports of post-mortem examinations on congenital deaf-mutes, defective development is not uncommon within the auditory sac. The result of such arrest may be total absence of the labyrinth or deficiency in its component parts. The cochlea is sometimes reported to have a smaller number of turns than usual; one or more of the semicircular canals have been found wanting; or the fenestræ may be absent or ossified.

There is little more to add. Most of these cases of deafness are beyond the resources of our art before they are admitted to the Deaf and Dumb Institutions. I need not repeat the plea so often made for the early diagnosis and treatment of all diseases of the ear. Children frequently come to the Institution to be told for the first time that their deafness is incurable, and the parents quote opinions to the effect that their child's hearing would come right at seven or at fourteen years of age. Now this is such a common experience amongst teachers, that I have been asked by Mr. Addison, our Head Master, to mention the matter in this paper. Talk like this must be either founded on ignorance or be due to a delicacy about the statement of an unpalatable truth. But it is fraught with the greatest danger; it prevents the parents of deaf children from seeking advice at the right time, and it postpones in like manner the adoption of proper methods of education till the most valuable years of childhood have slipped away.

OSTEOMA OF THE MASTOID.

By J. ORNE GREEN, M.D.,
CLINICAL PROFESSOR OF OTOLOGY IN HARVARD UNIVERSITY.

Case 1.—P. H. K., aged sixteen years, a strong, healthy boy, had known he was somewhat deaf in one ear for several years, but had thought nothing of it. Both he and his parents asserted positively that he had never suffered from ear-aches or otorrhœa. Three weeks before I saw him on November 18, 1890, he began to have redness, swelling, and pain just below the ear, and, on examination, a very superficial abscess was found between the mastoid and the jaw: this was opened and evacuated. The meatus was completely filled with a smooth, hard growth rising from the posterior wall, and the exploring needle proving this to be osseous, a diagnosis of exostosis was made.

Three days after there was increase of pain and discharge from the meatus, apparently forced out from behind the growth; the abscess-cavity having healed. In another three days the tissues over the mastoid became red, swollen, and œdematous, and the bone was sensitive on pressure. I thought I detected slight movement of the mass in the meatus in manipulating it.

With a closed meatus and increasing pain and discharge an operation was imperative, and under ether the auricle was turned forwards, exposing the anterior part of the mastoid, when immediately a movable, hard mass on the anterior surface of the mastoid was exposed and readily enucleated with a director. Its removal cleared and exposed the meatus, for it had constituted the whole posterior wall of that passage.

The growth lay imbedded in the mastoid and was surrounded by caseous material, epidermal flakes, and a small amount of pus, and the osseous walls of the cavity were carious superficially. All foreign matter and softened bone were removed, the cavity

and meatus, which had become one, were cleansed with corrosive sublimate solution, 1–3000, and an antiseptic dressing applied. The drum-membrane was enormously swollen, but not perforated.

Daily antiseptic cleansing was used, and at the end of a week, all odor having disappeared and the discharge having greatly diminished, the auricle was stitched into position and in a few days was firmly adherent. The daily cleansing was continued through the meatus and by December 20th the discharge had ceased, the cavity and the meatus were covered by a normal epidermis, the landmarks of the drum-membrane had reappeared, and the hearing was nearly perfect.

Six months after the ear was normal in appearance and formation, except for the cavity in the posterior wall of the meatus which was covered with a firm skin.

The tumor was of an irregular oblong shape, 19 *mm* long, 15 *mm* wide, and 9 *mm* thick; it was composed, as Dr. W. F. Whitney reported, of true bone in its interior, showing well developed bone-corpuscles, and the outside was entirely covered with a layer of cartilage which had ulcerated in two spots where the underlying bone was carious superficially.

CASE 2.—J. W., aged twenty-one years, a healthy man, was seen on October 31, 1892. He had been deaf in the right ear for several years, but had never suffered from pain or discharge till ten weeks ago, when the ear began to discharge without known cause, and for the last week he had had much pain in the ear and over the right side of the head. Examination showed the right meatus completely closed by a hard, bony tumor, which was slightly movable. There was a slight amount of purulent discharge from the deeper ear passage, but no increase in temperature or general symptoms. The tumor was covered with normal skin, and there was no swelling or tenderness of the mastoid.

On November 1st, under ether, the auricle was displaced forwards, and the tumor was immediately exposed lying in the mastoid and constituting the posterior wall of the osseous meatus. It was freely movable and easily taken out with forceps, like any foreign body, leaving a large cavity in the bone, which contained detritus and the walls of which were carious superficially. After thoroughly cleansing with corrosive sublimate solution, 1–3000, the auricle was stitched into place, a cotton tampon inserted in the meatus, and a baked gauze dressing applied.

On November 5th the stitches were removed, and the meatus, in which some granulations were seen, was thereafter dressed daily. On November 12th, the wound had firmly united by first intention throughout, the granulations of the meatus had disappeared, but there was a small amount of purulent discharge from that passage. On November 21st, all discharge had ceased, the drum-membrane was without perforation, but still much swollen, and the landmarks were not yet visible. The hearing was rapidly improving. W. r., $\frac{50}{100}$; V. r., $\frac{15}{20}$; and there were no subjective noises.

Dr. Whitney reported of the tumor that it was an oblong rounded growth, 12 *mm* long and 11 *mm* thick, with a fibrous-looking surface. The centre was occupied by a hard bony mass. Microscopic examination showed the outer layers to be made up of a fibrous tissue, while the centre was true bone with regular, well-formed bone corpuscles. On two small spots it showed superficial caries.

The ordinary bony growths of the meatus are of two varieties, the exostosis arising from the very deepest meatus, usually close to the membrana tympani, showing more or less attempt at pedunculation, but firmly attached to the underlying bone; and the hyperostosis, an extensive enlargement of the bone over a considerable extent of its surface, broad-based, without any attempt at pedunculation, and arising from the walls of the osseous meatus, in most cases farther outwards than the exostoses. Our two cases presented tumors entirely different from these common forms however. The tumors lay just within the orifice of the meatus, and evidently arose from its posterior wall. On superficial examination they appeared firmly attached, but by careful pressure a very slight movement was perceptible. Their distinctive character, however, was perfectly evident after removal; both were growths of true bone, oblong, and covered throughout, except at two minute spots, each the size of a large pin's head, with tissue, one with cartilage and the other with fibrous tissue. Both were situated in the anterior and outer part of the mastoid, but not attached to that bone, and both were lying in carious cavities.

The history of both cases was exactly alike. No account

of ear-aches or otorrhœa months or years before, but merely the story of deafness of several years' standing, coming on without any symptoms, then for a few weeks gradually increasing pain, discharge, and swelling about the ear, which led the patients to seek advice. In neither case was the drum-membrane perforated, although it was enormously swollen.

The cause of the final inflammation is not clear. There was no history of a sudden attack of earache which might have set up a suppuration behind the growth, and so have led to the carious condition, but rather one of a slowly increasing inflammation, as if the tumor either had outgrown its supply of nutrition and was being thrown off by a natural process, or else by its increasing size had interfered with the circulation of the meatus and thus caused the suppuration.

No signs of any attachments of the tumors to the bone could be made out, unless we regard the small spots of caries as the original seats of such attachments. The fact that these carious spots were in two different places on each tumor is decidedly against this theory, however, and the existence of the caries is readily explained by the suppuration which was occurring around them. Both occurred in males of early adult life. On the whole, it seems probable that we were dealing here with true neoplasms of slow, non-inflammatory growths, and possiby of fœtal origin, and from their structure the name *osteoma* seems most appropriate.

A SERIES OF CASES OF NEW GROWTHS OF THE EAR.

By J. ORNE GREEN, M.D.,
CLINICAL PROFFESSOR OF OTOLOGY IN HARVARD UNIVERSITY.

THE accompanying cases seem worthy of being recorded as offering unusual varieties of aural disease.

EPITHELIOMA OF THE AURICLE; AMPUTATION; RECOVERY.

J. S., aged about sixty years, was seen on October 26, 1891, giving a history of a growth on the anterior of the antihelix beginning two years before without known cause as a small wart. It had gradually enlarged and ulcerated, and for the last four months he had suffered much shooting pain in both the ear and side of the head. Examination showed a superficial ulceration confined to the anterior surface of the auricle, about seven-eighths of an inch in diameter, with everted and indurated edges. It was firmly attached to the cartilage, but apparently had not extended into that tissue. It was not sensitive, and there was no involvement of the glands in the neighborhood.

The appearance, duration, and increase in the growth leaving little doubt of the diagnosis, amputation of the whole auricle was advised, and the next day it was done under ether, the entire auricle with the cartilage down to about the middle of the cartilaginous meatus being removed by dissection. A portion of the lobule was retained as was also the tragus. Care was taken to dissect off the skin at the orifice of the meatus and to leave enough skin from the posterior of the auricle to close the wound completely. Antiseptic precautions were used, and a dry sublimate gauze dressing applied.

On October 31st the dressing was removed and it was found that the wound had healed by first intention throughout and the cat-gut sutures had almost disappeared by absorption. A collodion dressing was applied for four days more and the patient then discharged well. Dr. W. F. Whitney, on examination microscopically, reported the growth as epithelioma.

In May, 1892, there was no sign of the return of the growth, the patient remaining perfectly well and the hearing being good.

The radical operation of amputation seemed advisable from the firm adhesion of the growth to the cartilage and its great extent. The lobule and tragus were retained as supports for an artificial auricle to be worn later. The retention of the skin of the meatus and for a short distance into the concha is very desirable to prevent the closure of the meatus by granulation tissue, which it is very difficult, if not impossible, to prevent where a granulating wound is left, and which I have seen occur in a similar case in spite of every effort to prevent the closure.

EPITHELIOMA OF THE MEATUS; REMOVAL OF THE CARTILAGINOUS MEATUS; RECURRENCE; DEATH.

Mrs. C. S. H., aged eighty years, appeared at the Massachusetts Charitable Eye and Ear Infirmary, September 8, 1891, with a history of otorrhœa on the left side of two years' duration, and of a recent sense of fulness of the ear with pain in the upper parietal region. The meatus was completely filled with a firm growth of broad base springing from the superior and anterior walls of the cartilaginous canal. Under ether this was removed with the snare and curette by one of my colleagues, with relief to the pain and fulness, and Dr. Whitney reported that the specimen consisted of fibrous tissue and round cells, giving the appearance of a fibroma.

By October 1st, in spite of appropriate treatment, the growth had recurred so as to fill the canal, and the pain and fulness had returned. On October 30th, the meatus was tightly closed and the growth began to be nodulated on its external surface and there was dull aching in the ear, and sharp lancinating pains to the temple and lower jaw. There were no glandular enlargements.

On November 3d, under ether, the auricle and cartilaginous meatus was dissected from behind and turned forwards, the cartilaginous separated from the osseous meatus, and the whole cartilaginous meatus removed with the new growth attached—the cartilage externally being cut off just at the orifice of the meatus. After removing the cartilage the deeper meatus was found to be filled with a separate growth, soft and smooth, which was removed with the snare, leaving the meatus clear, with its osseous walls denuded, but apparently not carious. The drum-membrane showed signs of old disease, being thickened and adherent to the promontory. The attachment of the second growth could not be made out as it came out so absolutely clean as to leave no signs of its origin. From the results of the microscopic examination it was probably a granulation growth from the osseous meatus. The auricle was then replaced and stitched by cat-gut sutures and the meatus tamponed with sublimate gauze, after thorough cleansing with corrosive sublimate solution, 1–3000. A dry sublimate dressing was applied to the auricle. The meatus was cleansed twice daily with corrosive sublimate solution, 1–3000, and kept tamponed with a cotton pledget soaked in carbolic oil.

On November 8th, the wound behind the auricle had apparently healed, except three small stitch-abscesses, but two days after broke open, and finally healed slowly by granulation. On November 18th, all suppuration had ceased, and by the 25th, the auricle was firmly united and the meatus was covered with a healthy skin, except at the lower anterior portion. Two weeks later this spot had healed and all discharge from the meatus had ceased.

Dr. Whitney reported the growth from the cartilage an epithelioma, that from the deeper meatus a round-cell polypus of the ordinary variety.

The patient remained well for only a few weeks when there was recurrence of the growth apparently from the anterior wall of the meatus, which was removed by Dr. Blake in the same way as at first by displacing the auricle forwards, but the growth recurred almost immediately, and the whole auricle and tragus were then removed by him and the wound healed well.

In September, 1892, there had been a recurrence of the growth in the meatus which was nearly as large as the first, and within a few weeks the glands in the neighborhood became infiltrated, but there was no marked pain. The patient had become gradually

weaker, when one day the growth was found to be much less prominent than usual, "to have settled into the head," and simultaneously with this a complete hemiplegia of the right side occurred, followed by death on the next day. No autopsy and no exact history of the final symptoms could be obtained.

PRIMARY SARCOMA OF THE MEATUS; REMOVAL; RECOVERY.

J. S., a stout healthy girl, aged seventeen, during a cold in the head, had pain in the right ear followed by discharge, the beginning of which she could not define accurately. The pain ceased when the discharge began. After some three weeks of discharge unattended by pain or other symptoms, she began to have severe pain at night in the deeper meatus, and after five days of this was seen by me on October 25, 1889.

There was a moderate amount of semi-purulent discharge in the meatus, and a round fleshy tumor somewhat larger than a pea on the anterior wall of the right cartilaginous meatus. The tissue surrounding this tumor was so greatly infiltrated and bled so freely on touching it with a probe that I suspected it immediately and, after removal by the snare, sent the growth to Dr. W. F. Whitney, who reported it "to be composed of small round and spindle cells with a slight granular interstitial tissue. The blood-vessels seem mere channels rather than true vessels. Microscopically the growth has the structure of a sarcoma."

The tumor itself was wholly removed by the snare with very free bleeding, and its base was cauterized with argentic nitrate, but instead of healing as ordinary inflammatory growths do when arising from the walls of the meatus, the surrounding tissue became more œdematous and swollen, and there was an immediate recurrence of the growth, which on November 8th, had reached nearly its former size. It grew from a broad base, and the surrounding tissue nearly to the drum-membrane was infiltrated and apparently fluctuating. Not only the projecting tumor itself, but all of the swollen tissue bled freely on touching, and a probe could be passed into it without force to the depth of half an inch without evacuating any fluid or touching any bare bone.

It was treated simply by warm douching with morphine internally for the pain, but continued to enlarge without showing any

attempt at pedunculation and the surrounding tissue was extremely friable. There were no enlarged glands anywhere and no family history of malignant growths.

On December 1st, under ether, a drop of a 4 % solution of cocaine was injected subcutaneously in four different spots and then with a curette all the affected tissue was removed, laying bare the cartilage and bone. No sinus in either of these tissues could be discovered. The effect of the cocaine was so successful in checking the hemorrhage that there was no obstruction of the view, and not more than one drop of blood was seen. The meatus was dressed with a pledget of cotton soaked in carbolic oil, 1–10, and over this was a dressing of sublimate cotton. Sublimate irrigation, solution 1–3000, was used every second day, and the former dressing renewed.

The pain was entirely relieved within two days and never recurred. The skin gradually formed over the exposed surface without any suppuration or exuberant granulations, and on December 23d the ear was well. One month after the ear was absolutely perfect in appearance and the hearing was normal.

Dr. Whitney again examined the growth removed at the second operation and reported as follows: "It is composed of round cells with a very fine homogeneous intercellular substance; among these round cells are imbedded large multilocular cells (giant-cells), and the growth is traversed by numerous relatively large blood-vessels. The diagnosis is sarcoma of the giant-cell variety of the teleangiectatic form."

The patient remained well in May, 1892.

Primary sarcoma of the meatus must be a very rare disease. I myself have never met with a case before, and the only references to the disease which I can find in the literature of the ear are a case of osteo-sarcoma of the meatus described by Buck[1] and a case of sarcoma of the meatus by Sheild.[2]

The characteristics in this case which immediately aroused my suspicions were the infiltration of the surrounding tissue, the bleeding on touching, and the friability of all the affected tissue, which was evident at the first examination

[1] *A Manual of Diseases of the Ear*, p. 118.
[2] *Archives of Otology*, January, 1892.

and which increased as the disease progressed; a probe could be readily thrust into its substance at any point without violence.

The operation offered nothing worthy of note except the use of the cocaine which exceeded my expectations in wholly checking hemorrhage from an extremely vascular growth, thereby enabling me to see perfectly throughout the whole operation. The rapid healing without suppuration shows the value of the antiseptic dressing.

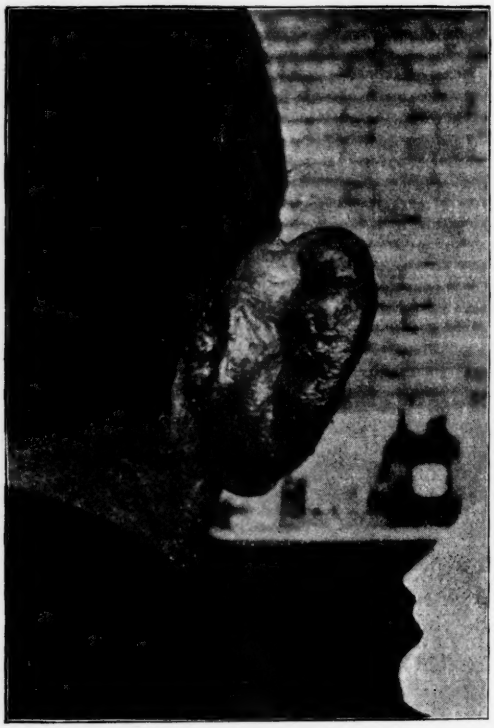
CAVERNOUS ANGIOMA OF THE AURICLE; LIGATION OF THE EXTERNAL CAROTID; REMOVAL; RECOVERY.

G. E., aged twenty-five, a robust, healthy man, was born with an angioma on the upper part of the right auricle. This gradually enlarged as he grew up, and for a year before he was seen at the Massachusetts Eye and Ear Infirmary in November, 1889, it had been ulcerated on its anterior surface and he acknowledged violent hemorrhages from the ulceration, the last one about one week before entrance. All were checked by a compress over the surface. The only symptom complained of at entrance was a violent throbbing on that side.

The whole auricle was a mass of tortuous blood-vessels, some as large as a lead-pencil, and the same mass of vessels extended back over the mastoid for about an inch. The vessels were bluish in color, but evidently communicated freely with arteries, for nearly the whole mass was pulsating violently. On the anterior surface was a thick crust, and beneath it evidently quite a large cavity. Pressure over the carotid artery checked the pulsation almost entirely and much reduced the tension of the tissues. There was no involvement of the occipital artery. The auricle measured fully four inches from its upper to its lower edge (*vide* illustration).

November 27th, under ether, Dr. S. J. Mixter, Consulting Surgeon of the Infirmary, ligated the external carotid artery just above a small artery passing towards the median line, which was probably either the thyroid or the lingual. All pulsation in tumor and occipital artery ceased immediately, and the auricle diminished very perceptibly in size and lost its tension; but large masses of vessels remained behind, above and below the

auricle. The crust over the antihelix was removed with forceps and about half a minute afterwards very profuse venous hemorrhage occurred from about the centre of the spot previously covered with the crust. This could only be controlled by pressure just below the bleeding spot, and as it was impossible to determine the course of the vessel from which the hemorrhage came, a stitch was passed directly through the auricle from behind, over the vessel and back again through the cartilage,



tied, and the vessel, thus enclosed in the loop, controlled completely. The whole surface of the antihelix over which there had been a crust was in a state of superficial ulceration with a slight amount of pus and with hypertrophied papillæ. After thorough cleansing with sublimate solution an antiseptic dressing was applied so as to exert slight pressure over the whole auricle.

November 28th.—Restless night, with much complaint of soreness in the neck, but otherwise doing well.

December 2d.—Since the operation patient has been doing well,

except for an attack two days ago of acute rheumatism in feet and knees, relieved by salicylate of soda. Last night a sudden discharge from just below the auricle of an apparently seropurulent fluid, odorless, probably amounting to half an ounce. This morning the tension of the auricle is much less than two days ago. No pulsation anywhere. The enlarged veins above, behind, and below the auricle are very much diminished from two days ago. No discharge from opening of last night. Ulceration over antihelix about the same. Dressed with iodoform.

December 4th.—Wound unsealed yesterday; found to be suppurating slightly through a small opening; no induration of the neck.

December 7th.—Wound still discharging; no inflammation of surrounding tissues. Within two days the least little pulsation is to be felt at insertion of auricle behind. No pain. The patient confesses to many previous hemorrhages, one amounting to one pint.

December 11th.—On removing dressing this morning a violent venous hemorrhage occurred from the same spot as on first operation, the stitch having ulcerated through the cartilage; it was checked by a compress and bandage. Amputation advised on consultation with Drs. Mixter and Morse. Patient etherized and angioma removed by Dr. Mixter by slow dissection, lasting two hours and a quarter. Every bit of the angiomatous tissue was apparently removed. Four or five nutrient blood-vessels entered the mass from the deeper tissues. The skin at the orifice of the meatus was saved, but the cartilage down to within the orifice of the meatus was removed. A large amount of blood was lost, but not more than would be expected from the character of the disease. After all the angiomatous tissue had been removed an incision parallel to the first cut and two inches behind it was made through the scalp, the scalp dissected up, and this piece slid forward and stitched over the exposed wound. Many vessels were tied, some with cat-gut, some with silk, and all cut short. Operation was done with antiseptic precautions and dressed antiseptically. The patient bore the operation well.

December 16th.—Has been doing perfectly well. There is scarcely any pain and the wound looks nice.

December 23d.—A large number of grafts of epidermis were applied to granulated surfaces of posterior wound.

December 28th.—A large number of grafts have taken finely. The wound is looking well.

January 1st, 1890.—The patient discharged nearly well.

The final hearing was delayed some weeks by a heavy silk ligature on the largest of the ligated arteries, but when this came away the wound closed perfectly, and no trace of angiomatous tissue could be discovered anywhere. The deeper meatus had never been invaded by the growth and the hearing was perfect.

The patient was seen several months afterwards. There was no sign of any recurrence, and he was wearing an artificial auricle with satisfaction to himself.

ANGIOMA OF THE TYMPANUM.

T. McK., aged forty. Father died at sixty-six years of age. Mother and six (all) brothers and sisters living and well. Never sick until four years ago, then he had two hemorrhages from the mouth and was in the Massachusetts General Hospital for ten days. Told that he had bronchitis. Three winters ago he had the "Grippe." The following spring the left ear began to feel full, the hearing to fail, and he had noises. A little later the ear commenced to pain him, at first only slightly. His hearing and the pain continued to get worse and worse through the summer, and the noises like the ringing of bells increased, and in October he came to the Infirmary. Paracentesis was done, but no discharge from the ear followed. Pain was somewhat relieved, but the noises and fulness continued. About a month later paracentesis was again done and a little later a polypus removed. Last May paracentesis was again done, after which there was a tremendous hemorrhage. The ear was packed and he remained lying down in the hospital two hours before the bleeding was stopped. He was sent home and told to stay in bed for two days. There was no more hemorrhage. Since then paracentesis has been done twice, the last time two months ago, after which there was only slight hemorrhage. Pain continues, but is less. At times it is so severe as to keep him awake, and at times extends down the neck and over the mastoid. Hearing remains unchanged. At times he feels dizzy. Noises like little bells are constant.

Tests. W. r. $\frac{38}{60}$; l. $\frac{c}{60} = 0$. V. r. $\frac{18}{28'}$; l. $\frac{0}{28'}$.

Rinne F. C. $\frac{a\,c}{b\,c}$ r. $\frac{30}{12''}$; l. $\frac{0}{16''}$. Weber F. C. r. > l.

Patient is fairly developed and nourished. The left meatus is of fair size and moderately straight and without signs of congestion. The situation of the drum-membrane is occupied by a membrane of good polish and irregular surface all of which, except the anterior and upper quadrant, projects slightly and is of a reddish color, deeper in some spots than in others. No landmarks are visible. By the small light reflexes on its surface, the whole surface can be seen to beat synchronous with the radial pulse. The whole projecting mass is very soft and readily compressible with the probe. Deep pressure on the common carotid reduces the pulsation, but does not check it entirely. By Valsalva air enters freely with slight movements, but without change in the appearance. The highest-pitched fork is just heard by A. C. All other forks not heard by A. C. Galton, lower not heard, high heard, and very high quite well heard.

December 12th.—Ear plugged with absorbent cotton to-day and firm pressure applied to the pulsating mass.

December 17th.—Pressure continued. Pulsation seems less marked and is not heard so distinctly by the patient.

December 24th.—Deep firm pressure with cotton tampons continued daily for six hours. No pulsation visible. The character of the mass has changed from an irregular surface with deep red spots to a smoother surface of a pinkish color, and has lost its venous look. No throbbing felt.

December 31st.—Pressure has been continued daily. Mass is not changed in appearance, except to be paler and more grey. No throbbing felt or heard, and no pulsation visible. Hearing is the same as on entrance.

The absence of all pulsation, objectively and subjectively, continued for about two months, when there was a return of the subjective throbbing in a slight degree, unaccompanied by any of the old symptoms of pain, bells, or vertigo. There had been no change in the hearing. After that time I did not see the patient till November, 1892. There was only slight pulsation felt and that only occasionally. There was no pain and the hearing was the same. All landmarks on the drum-membrane were obliterated, but the membrane itself was somewhat nodulated, of a pinkish color, and somewhat yielding to the probe. No pulsation could be perceived.

The appearance of the drum-membrane in this case when I first saw it gave the impression on a superficial examination of a

membrane bulging from a collection of bloody serum in the tympanum, but a more careful inspection showed that the membrane, manubrium, and short process were all involved in some form of tumor which filled the tympanum, and the distinct pulsation of the whole surface proved, I think, that it was composed largely of blood-vessels. The history of the previous hemorrhages following paracentesis confirmed this.

I determined to try the effects of pressure by cotton tampons, and applying them at first for only six hours a day was soon enabled to keep them in for twelve hours without irritation. Under this treatment, within ten days the pulsation had ceased both objectively and subjectively, to the very great comfort of the patient. At no time was there any complaint of pain or vertigo from the applications. The absence of all pulsation for about two months showed a measurable degree of success, and I cannot but think that a further course of the same treatment, if the patient had been willing to follow it, might have obliterated the circulation and produced a cure.

I have called the tumor an angioma, as this seems to me to be the probable diagnosis, for the extent of the growth, its irregular surface, and venous appearance, speak rather for that than for an aneurism.

ANGIOMA OF TRAGUS.

A. E. P., aged forty-one, has been perfectly well until an attack of typhoid fever in 1888–89. Following the typhoid fever she began to have discharge of blood from the ear, at first drop by drop and only once in two or three months, later increasing to once every week or ten days, and soaking from five to thirty handkerchiefs. She has no pain in the ear, but a continual throbbing, and occasionally an attack of very severe headache. The attacks have no connection with menstruation.

Examination: General condition is excellent. On the inner side of the tragus there is a small discolored patch covered with a small crust of dried blood. There is marked swelling of the upper anterior wall of the cartilaginous canal, so that the membrana tympani is seen with difficulty. Membrana tympani is normal. The hearing is good.

October 28th.—Under ether, the angiomatous tissue is found to be superficial and well defined and of smaller extent than supposed. It was removed by dissection with very little bleeding and the

wound brought together with cat-gut sutures. A dry dressing applied.

November 3d.—Stitches removed. Good union by first intention.

November 5th.—Wound firmly healed. No throbbing or bleeding since operation.

Since that time I have heard nothing from the patient.

TWO CYSTOID POLYPI OF THE MIDDLE TURBINATED BONE.

By W. FREUDENTHAL, M.D., New York.

(*With four drawings in the text.*)

WHILE a good many cystic polypi have been operated and their clinical features described by various authors, the result of microscopical examinations of these tumors has been but seldom published. One reason for this may be that many operators are made aware of the nature of such growths only through the copious discharge of serum, which suddenly gushes forth at the moment of removal, as exemplified by the cases of Lefferts[1] and Seiler.[2] A great confusion reigns regarding not only the nomenclature but also the development of these cysts.

To mention a few of the many workers in this field, Lennox Browne[3] thinks that "cystic degeneration is also sometimes said to be due to liquefaction of the myxomatous tissue," and on this point, as will be seen later on, he comes very near to my views. Lalit[4] describes a myxomatous polypus filled with colloid substance. A thick layer of connective tissue surrounded the cavity. The dissertation of Haken is known to me only through the report in the *Internat. Centralblatt für Laryngologie.* He expresses similar views to those which will follow.

---

[1] *Med. News*, Philadelphia, Dec. 15, 1883, vol. xiv., p. 653.
[2] *Med. Times*, 1884, p. 351.
[3] *The Throat and Nose*, Philadelphia, 1890, p. 601.
[4] "Sur un Cas de Polype Cystique des Fosses Nasales," *Annales de la Policlinique de Bordeaux*, Jan., 1890.

I also had made close microscopical examinations of two cases coming under my care, which I will now cite.

CASE 1.—Minnie R., a native of Russia, sixteen years old, came to the German Poliklinik complaining of severe headache and pains over the right eye, accompanied by obstruction of the right nostril. The last symptom was noticed within six months. On examination I found a tumor of the size of a split bean, attached to the mucosa of the middle turbinated bone of the right nostril by a pedicle somewhat narrower than the main tumor. Its surface was slightly hilly ; its consistency a trifle harder than that of ordinary polypoid tumors ; its color a grayish white-blue. I declared it to be a simple myxomatous polypus and operated it at once in the presence of some gentlemen of the Postgraduate Medical School. But at the moment of removal with a cold snare a considerable amount of a colorless viscid liquid was discharged, and the formerly voluminous mass shrank to a very small amount of tissue, which remained in my snare. This led me to the correct diagnosis.

Sections were made vertically through the long axis of the tumor. Under the microscope we see the free surface of the growth covered by a single layer of columnar epithelium. The main mass consists of a myxomatous tissue, densest along the periphery close beneath the epithelium and becoming looser towards the centre. At that point the meshes of the myxomatous network are of a considerable width, partly empty, partly filled with a faintly granular liquid. The vascular supply consisting of arterioles, capillaries and small veins, is scanty throughout the tumor and comparatively more abundant only in that portion which had served for an attachment to the mucosa. This pedicle is made up of a rather dense myxo-fibrous tissue, surpassing in density even that in the cortical portion of the tumor. Possibly the pressure of the snare has contributed to this condition (see Fig. 1).

The central portion of the tumor is taken up by an empty cavity running lengthwise through its longitudinal diameter. This cavity is nowhere bordered by a membrane or capsule of its own ; but all over its periphery it appears to be surrounded by the myxomatous tissue building up the main mass of the tumor with considerably widened meshes.

With a power of 500 diameters the features prove to be as fol-

lows (see Fig. 2). The columnar epithelia are of varying sizes, according to the hilly elevations on the surface and the valleys between them, and indistinctly nucleated. The narrowest columnar epithelia are seen in the valleys, the broadest on the tops of the hills. Between the fully developed epithelia we notice everywhere conical wedges, and all these formations are separated from one another by a distinct light layer of cement substance. The border line between the epithelia and the subjacent connec-

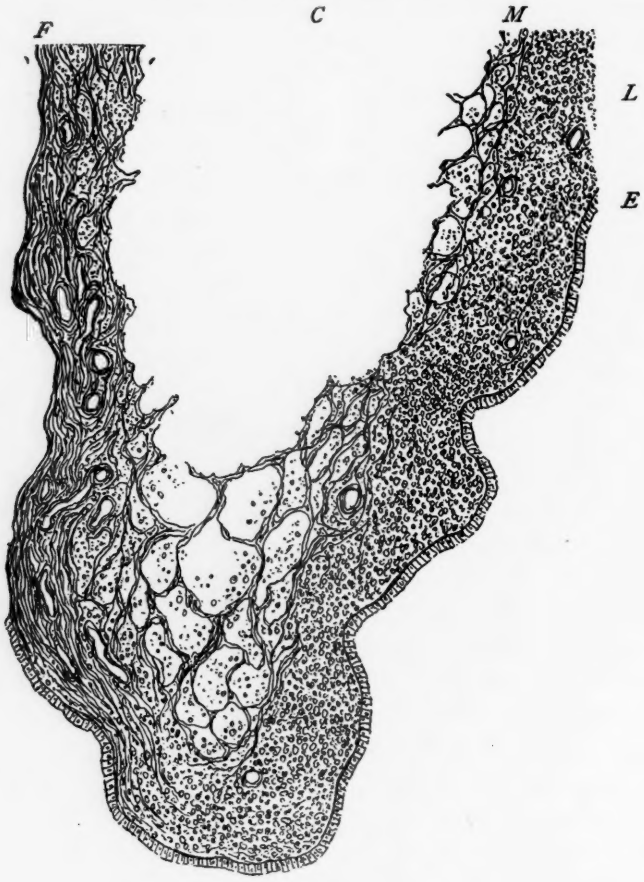


FIG. 1.

Myxoma in Cystic Degeneration. × 50.

E. Covering columnar epithelium.
L. Cortex of tumor made up of lymph or adenoid tissue.
M. Myxomatous tissue of the type of that of the umbilical cord.
F. Delicate fibrous connective tissue at the root of the tumor, richer in blood-vessels than the rest of the tumor.
C. Cyst, result of liquefaction of the myxomatous tissue.

tive tissue is, in many places, sharply defined, in others, on the contrary, but little pronounced, so much so that in the latter situations it is almost impossible to exactly define the line where epithelium ends and connective tissue begins. The tissue beneath the epithelium consists of a dense myxomatous reticulum with a scanty supply of protoplasmic bodies in the meshes. The pedicle shows an extremely dense network of a myxo-fibrous tissue, apparently lacking protoplasmic bodies. In some places, however, the cortex of the tumor is abundantly supplied with lymph-corpuscles to such an extent that a regular lymph or adenoid tissue is produced, which invariably remains confined to the cortical portion (see Fig 2).

The central portion resembles somewhat the structure of the umbilical cord. It is made up of large branching tracts of protoplasm or fibrous connective tissue. A number of these tracts contain capillary blood-vessels, either compressed and exhibiting an extremely narrow calibre, or solidified by a proliferation of the endothelial wall, whereby the vessel is obliterated (*O*). The meshes hold a finely granular myxomatous basis substance and a varying number of non-nucleated protoplasmic bodies, nowhere on an average in excess of the size of lymph-corpuscles. Many meshes appear to be considerably widened and filled with a uniformly granular mass of coagulated albumin, closely resembling the liquid of œdema after preservation in chromic acid solution. Both the trabeculæ and the granular masses filling the meshes border the central empty cavity in a rather irregularly wavy line.

The scanty blood-vessels traversing the tumor, especially the capillaries, are conspicuous by a broad adventitial coat of a delicate fibrous connective tissue blending with the myxomatous tissue. The veins appear engorged with red and colorless blood-corpuscles, obviously in consequence of the application of the snare around the pedicle.

Case 2.—H. S., a tailor, twenty-one years old, born also in Russia. He visited the clinic on October 8, 1892, with complaints of obstruction of the left nostril. On examination I found a tumor pendent from the middle turbinated body. It was of the bulk of a middle-sized bean and of a soft consistence. Its surface was but slightly hilly, in most places even. Its color of a grayish-red, deeper than in the previous case. I removed it in the same manner as in the previous case and with like result.

Sections made vertically to the longitudinal diameter of the tumor exhibited a covering layer of columnar epithelium over its main periphery. This layer is changed into stratified epithelium, in the lower portions only with hornified epidermal scales.

The main mass of the tumor is composed of the myxomatous variety of the connective tissue, densest toward the points of attachment to the mucosa. A cortex as in the previous case is

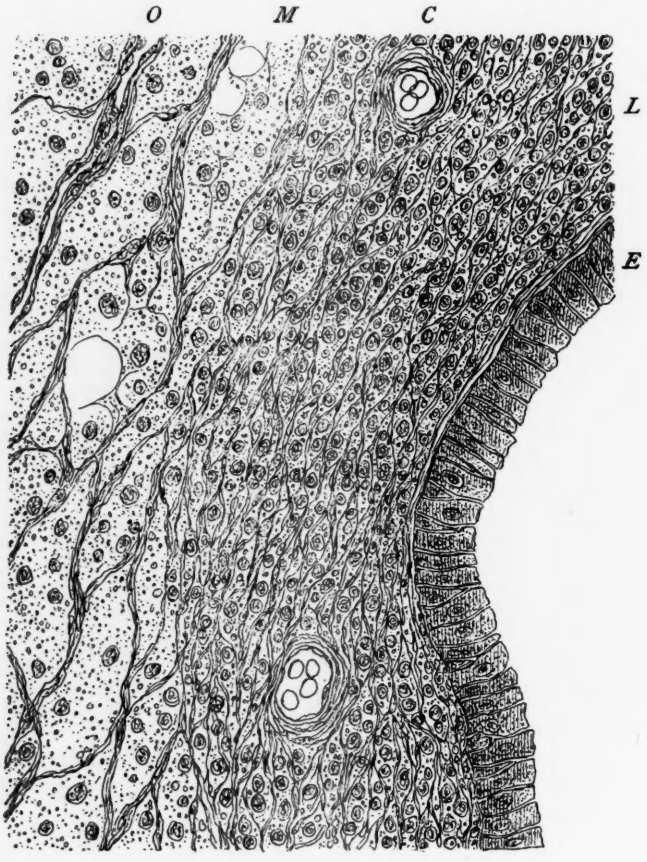


FIG. 2.

Myxoma in Cystic Degeneration. × 500.

E. Covering columnar epithelium.
L. Cortex of tumor, made up of lymph or adenoid tissue.
M. Myxomatous tissue in beginning liquefaction of basis-substance.
C. Capillary blood-vessel, in transverse section.
O. Obliterated capillary blood-vessel.

nowhere conspicuous. The vascular supply, consisting of arterioles, veins, and capillaries, is only moderate. The veins are mostly wide and engorged with blood. Extravasated blood is seen at the points of previous attachment, owing, evidently, to the mechanical injury done by the snare. Here and there we

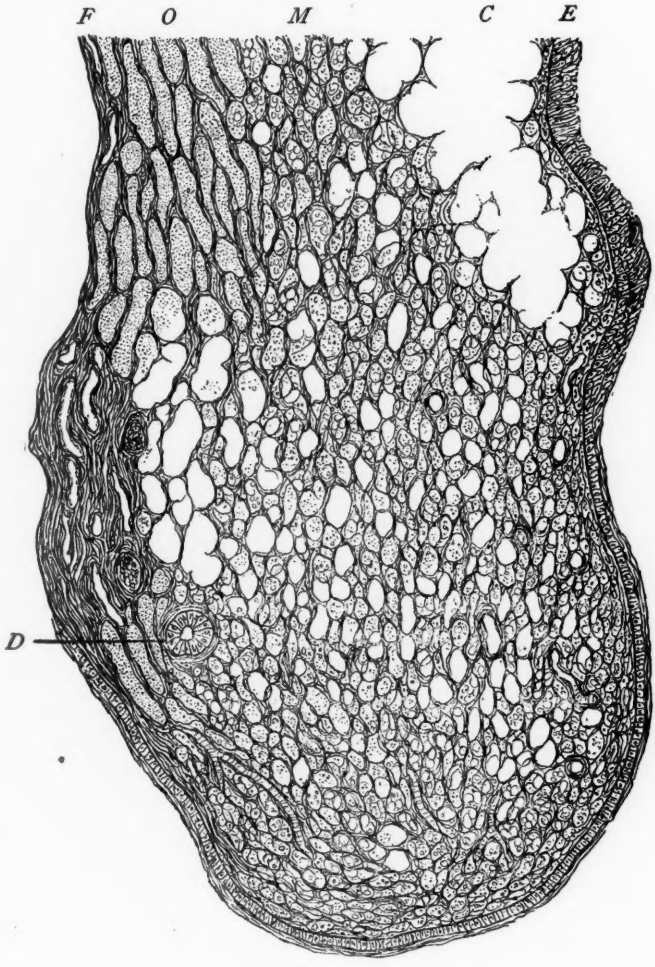


FIG. 3.

Myxoma in Cystic Degeneration. × 50.

E. Covering stratified columnar epithelium.
C. Cystic cavity.
M. Myxomatous tissue with transitions to cysts.
O. Œdematous myxomatous tissue.
F. Fibrous connective tissue at the root of the tumor.
D. Duct of mucous gland in transverse section.

meet with transverse sections of ducts of mucous glands, but the mucous glands are absent everywhere (see Fig. 3).

An empty cavity was seen at the upper periphery of the tumor occupying about a third of the diameter of the tumor. This cavity was not bordered by a wall of its own, but likewise, as in the previous case, by myxomatous tissue. A number of smaller cavities occurred near the root of the tumor, furnishing the transverse section with the appearance of a sieve.

With a power of 500 diameters the columnar epithelium appears to be of the variety termed stratified, inasmuch as not only numerous wedges are seen between the feet of the epithelia, but several nuclei are visible in the bodies of the epithelia. Further downward the epithelial cover is distinctly stratified, consisting of a single layer of columnar epithelia, two or three layers of cuboidal, and a thin layer of flat, horny epithelia. The border line between the epithelium and connective tissue is nearly everywhere sharply defined, almost of the refraction of a so-called basement-membrane. The myxomatous reticulum is densest around the periphery, and especially dense, almost of the type of fibrous connective tissue, at the points of previous insertion to the mucosa. Here and there heaps of lymph-corpuscles are seen at the periphery, but nowhere very broad.

The myxomatous tissue of the main mass is of the type of the umbilical cord, *i. e.* composed of trabeculæ made up of delicate fibres containing numerous protoplasmic bodies, and a few obliterated capillary blood-vessels. The enclosed meshes are filled with a finely granular, partly fibrous basis-substance, with a varying number of protoplasmic bodies, the size of lymph corpuscles. Towards the empty cavity above described, the trabeculæ appear to be stretched, their meshes considerably widened, the basis substance in many instances absent. Similar features are seen at the place mentioned to be of a sieve-like appearance. The blood-vessels, especially the capillaries, are supplied with a narrow adventitial fibrous coat in connection with the myxomatous reticulum (see Fig. 4).

Both specimens immediately after extirpation had been placed in diluted alcohol, and after some time in a solution of chromic acid of the strength of half of one per cent. The second specimen was difficult to harden, and a repeated renewal of the chromic acid solution was required for this purpose. The specimens were imbedded in celloidin, sliced with the section cutter,

and the slices stained with a solution of ammoniacal carmine, and imbedded in glycerine.

Cysts in polypous tumors of the nasal cavity were mostly known to be the outcome of the widening of the newly formed mucous glands. We know that most of the so-

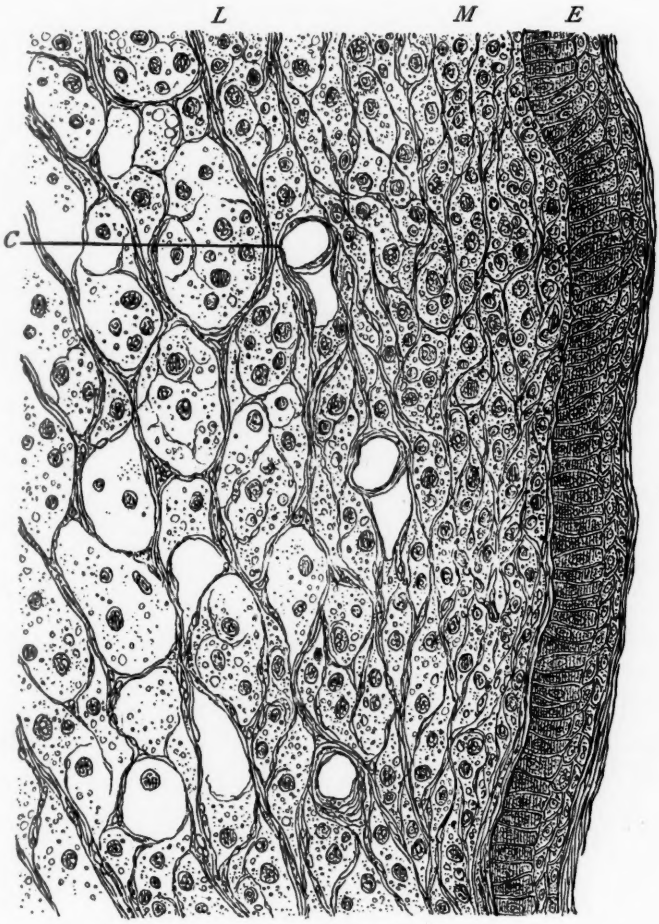


FIG. 4.

Myxoma in Cystic Degeneration. × 500.

E. Stratified epithelium.
M. Myxomatous tissue with wide meshes; beginning liquefaction of basis-substance.
C. Capillary blood-vessel in transverse section.

called polypi of the nasal mucosa are combinations of newly formed myxomatous connective tissue with newly formed acinous mucous glands; hence the scientific title of such tumors since Billroth and O. Weber, "myxo-adenoma." Should cystic cavities arise in such tumors, they invariably take origin from the glandular portion of the tumor and we can without exception trace the flattened epithelial lining of the cysts. In such an instance the scientific description of the tumor is "cysto-myxo-adenoma."

Quite different is the origin of closed cavities in my two cases. In both instances only myxomatous tissue has shared in the production of the tumors. In both glandular formations were absent. The proper designation of these growths is therefore "myxoma." The myxomatous tissue has in certain places undergone *liquefaction.* This process attacks first the basis-substance filling the meshes, next stretching of the trabeculæ takes place, together with obliteration of the capillary blood-vessels held therein. Ultimately liquefaction of the whole myxomatous tissue occurs, whereby a cavity is produced in the middle of the tumor, destitute of a wall of its own, but simply bordered by a partially liquefied or torn myxomatous tissue, exhibiting all transitional stages of liquefaction. Thus cavities filled with a viscid liquid are produced, which closely resemble the cavities so often seen in the substance of the umbilical cord.

Ordinarily cavities sprung from a liquefied basis-substance are termed cysts, the same as those originated in previous adenomas, viz., in epithelial structures. From a clinical standpoint this nomenclature may be justified; not, however, from the standpoint of the histologist. The latter will confine the name "cyst" only to formations lined by epithelia, developed from previous epithelia. Cavities, on the contrary, due to a partial liquefaction of myxomatous tissue, he will never admit to be genuine cysts, but only accumulations of liquid in spaces lacking walls of their own. Such cavities should be termed by a special name, as, for instance, "myxomatous cavities," and the tumor designated "HYDRO-MYXOMA" or "CYSTOID MYXOMA."

REMOVAL OF THE STAPES.

By CLARENCE J. BLAKE, M.D.

(*Continued from page 202 of this volume.*)

IN continuing the report of these operations it should be noted that the cases are given not chronologically, but with reference to their value as illustrating certain points touched upon in the text, the report of the cases in sequence being reserved for the conclusion of the paper in a later number of this journal and to be accompanied by a tabulation of the cases and their results. In two recent operations, to be reported later, the removal of the stapes was effected as in an earlier case reported in this number without division of the incudo-stapedial articulation and without tenotomy of the stapedius, traction being made upon the descending process of the incus so as to effect, first, the removal of the stapes from the niche, and, secondly, the separation of the malleo-incudal articulation, both bones in one instance being allowed to remain within the tympanum, and in two other cases, where the incudo-stapedial articulation was ruptured, the stapes being carried upward and backward by the pull of the stapedius muscle and the incus removed.

B. F. B., a young man, at that time nineteen years of age, was first seen in March, 1885; he was slight but well built and in good general health. The history of the case was that of a slowly progressive impairment of hearing of several years' duration and accompanied latterly by tinnitus aurium; the right ear had long been practically useless and the decrease of hearing in the left ear had led him to seek advice.

Both drum-heads were transparent, the Eustachian tubes were

free, and the mucous membrane of the nose and naso-pharynx was in good condition ; the hearing tests, however, both by aërial and by bone-conduction indicated interference with the sound transmission resulting from thickening and changes in the tympanic membrane especially in the neighborhood of the stapes ; the hearing for high tones was decreased in both ears, and the difficulty in hearing the voice was especially marked in reference to the soft consonant sounds and those of the harder consonant sound having slight qualitative differences. Under local treatment the hearing in the left ear markedly improved, only, however, to decrease later in consequence of severe head colds until, in October, 1892, when the question of an operation was considered and the hearing in the right ear was found so far decreased that Politzer's acoumeter was not heard at all, the voice within six inches only with difficulty, and the tuning-fork (562 v. s.) less than $\frac{5}{65}$ths.

The operation, done under ether November 5th, consisted in the usual curved incision along the posterior periphery of the membrana tympani, subsequent examination showing extensive folds of mucous membrane not only horizontally but also extending downward into the fenestral niche and so far impeding access as to make the removal of the malleus and of the posterior portion of the membrana tympani necessary ; the mucous folds were then divided as far as seemed required and the blunt hook was passed behind the descending process of the incus with a view to the extraction of the stapes and dislocation of the incus simultaneously. The extraction of the stapes was effected without trouble, though with considerable resistance, gradually yielding, however, to the traction made and giving a very definite sense of suction resistance, but on withdrawal of the hook both bones flew upward and backward and disappeared behind a projecting fold of mucous membrane ; as the niche was evidently clear, and there was free oozing from the fenestra no further attempt at the extraction of the bones was made, the ear was cleansed with dry absorbent cotton and tightly stopped.

The patient's recovery from the anæsthetic was good, there was neither pain nor vertigo, and the temperature and the pulse (the latter having slowed at the instant of the extraction of the stapes) were both normal. The hearing for the voice which was within the first twenty-four hours apparently much increased, though the patient complained of difficulty in understanding what was said

to him, at the end of twenty-four hours had begun to decrease. Three days after the operation the Politzer's acoumeter was heard in the right ear eight inches, and the tuning-fork aërially $\frac{2}{6}\frac{2}{0}$ths, and there was still sero-sanguinolent oozing. December 3d the tuning-fork was heard aërially $\frac{1}{6}\frac{5}{0}$ths, and by bone-conduction over the mastoid process $\frac{1}{6}\frac{6}{0}$ths, and the voice in ordinary conversation tone at a distance of three feet. In addition to the improvement in hearing resulting from the operation, there was a very definite relief, as expressed by the patient, from certain sensations of fulness and discomfort in the head, a change which suggested incidentally the testing of the other ear, when it was found that in the left ear the Politzer's acoumeter was heard, with the right ear closed, nine inches ; with the right ear open, ten inches ; and the tuning-fork aërially, with the right ear closed, $\frac{5}{6}\frac{}{0}$ths; with the right ear open, $\frac{1}{6}\frac{0}{0}$ths.

April 14, 1893, the right ear was dry, the membrana tympani had been reproduced with the exception of an opening about 3 *mm* in diameter, the Politzer's acoumeter was heard at a distance of twelve inches, the hearing for the voice was proportionately improved, and the tuning-fork, both aërially and over the mastoid, was heard $\frac{2}{6}\frac{0}{0}$ths.

Since this date the hearing has still further improved and the final report will be given in the concluding summary.

The length of time which has elapsed since the operation in the above case, with a steadily progressive improvement of the hearing and the retention of the dislocated ossicula in the tympanic cavity without evidence of disturbance of any kind, are points of interest. The gradual improvement in hearing, it is true, is in accord with subsequent observations in other cases, and the fact of an adequate blood supply to the stapes through the artery following the stapedius muscle and to the incus through the vessels following its posterior fan-shaped ligament, both of which attachments remained, accounts for the retention of the ossicula under conditions perfectly normal except in so far as their altered position was concerned.

That the stapes can be extracted from the niche and allowed to remain in the tympanum without injury so long as its blood supply is secured has been sufficiently proven

and the question very naturally arises in cases where the stapes is situated high above the posterior superior margin of the tympanic ring and with its stapedius tendon correspondingly inaccessible, whether extraction of the stapes without preliminary division of the tendon of the stapedius is not preferable to the form of operation first proposed in which the division of the tendon precedes the extraction of the stapes.

When also the altered relationships of the members of the ossicula chain to each other incident to the changes occurring in a chronic progressive disease of the middle ear are considered it is also a question whether in some cases an incudo-stapedectomy is not the preferable procedure.

With the secondary contraction of the tensor tympani and corresponding indrawing of the malleus and incus, the feasibility of luxation of the malleo-incudal articulation by traction upon the descending process of the incus is much increased, the fixation of the malleus by the contraction of the tensor tympani still further favoring the rupture of the malleo-incudal capsular ligament when the incus is rotated upon the long axis of its body to an extent corresponding to the excursion of the tip of the long process outward for a space of from two to four *mm*, the latter limit being reached in some instances coincidently with the contact of the long process of the incus with the superior posterior border of the tympanic ring a condition which changes the movement of the incus body from simple rotation to excursion inward and downward, thus completing the separation of the articulation.

The same process of dis-articulation by rotation is effected in the removal of the ossicles on account of caries by the use of Ludwig or Ferrer's incus hook or by the use of the curved curette, in both instances the rotation also serving to twist and rupture the fibres of the posterior ligament of the incus.

In two very similar cases in which neither the posterior ligament of the incus nor the stapedius muscle was divided and in which the stapes was extracted and the malleo-incudal articulation ruptured by simple traction of the blunt hook passed behind the incudo-stapedial joint, both bones,

when released, passed out of sight into the posterior portion of the tympanum and have there remained during a period of six months without symptoms of irritation or other evidences calling for their removal. In both cases the hearing was affected to nearly the same degree; in one of the cases the hearing to-day is sufficiently improved to have justified the operation, in the other it has not improved at all.

The three following instances of attempted stapedectomy in cases of chronic non-suppurative inflammation of the middle ear, progressive and of long duration, illustrate the observations of Schwartze[1] in reference to the changes that occur about the stapedo-vestibular articulation, and of Politzer[2] with reference to stapes mobilization.

Mrs. E. G., fifty-four years of age, slender and not very strong, had noticed an impairment of hearing gradually increasing and recently accompanied by annoying tinnitus; both drum-heads were indrawn and there was slight opacity not sufficient, however, to make it impossible to see the tip of the descending process of the incus. Politzer's acoumeter was heard in the right ear at the distance of one inch, the tuning-fork (562 v. s.) was heard in the right ear $\frac{15}{16}$ths and in the left ear not at all, but by bone-conduction over the left mastoid $\frac{30}{16}$ths tuning-forks Nos. 1 and 2 were not heard aërially with the left ear, but the Kœnig's rods were heard up to 35,000 v. s.

Under these conditions and with a distinct understanding that it would probably not be successful in materially improving the hearing, operation upon the left ear was advised and was done January 13th without general anæsthesia.

Five minutes before operation, three drops of a ten per cent. solution of cocaine were injected through the Eustachian catheter, and the preliminary incision, 1 *mm* in length, made upon the posterior periphery, and a ten per cent. solution of cocaine applied upon a cotton-tipped probe. One minute later the cut was continued upward along the periphery and downward upon the posterior border of the malleus, without pain, apparently, except at the latter point where the discomfort seemed to have been quite as much the result of the turning of the flap outward.

The stapes was found to be high up and the tendon of the stapedius was probably insufficiently divided as after section of

[1] *Pathological Anatomy of the Ear*, p. 120.
[2] *Lehrbuch der Ohrenheilkunde*, Dritte Auflage, p. 264 *et seq.*

the incudo-stapedial articulation the stapes when extracted by means of a blunt hook passed behind the head from below, disappeared superiorly and posteriorly, the extraction of the stapes from the window being assured by the turning of the stapes upon the hook until its foot-plate became visible, at which moment it slipped from the hook and instantly disappeared.

There was no pain incident to the extraction of the stapes and no vertigo, but at the instant of the separation of the stapes from its vestibular attachment there was a sensation of shock accompanied by a loud sound, as reported by the patient, and a momentary slowing of the pulse; there was no apparent outflow of fluid from the niche. The time occupied in the operation, including the tuning-fork and voice tests made during its progress, was twenty-five minutes.

Fifteen weeks later, the ear having in the meantime completely healed, the Politzer acoumeter was not heard in the left ear, the tuning-fork was heard aërially $\frac{3}{6}\frac{}{5}$ths and by bone-conduction over the left mastoid $\frac{4}{6}\frac{5}{5}$ths while the hearing for Kœnig's rods had decreased to 20,000 v. s.; still later the hearing for the tuning-fork had returned to what it was before the operation, without any change in the hearing for high tones.

Mrs. V. H., forty-six years of age, had impairment of hearing since childhood, slowly progressive until within the last few years and accompanied by circulatory tinnitus. Both drum-heads were transparent and the Eustachian tubes free; the Politzer's acoumeter was not heard in the right ear, and in the left only at a distance of half an inch, the hearing for the tuning-fork (562 v. s.) aërially was in the right ear $\frac{1}{6}\frac{5}{5}$ths, and in the left $\frac{2}{6}\frac{0}{5}$ths, while by bone-conduction over the mastoid it was heard in the right ear $\frac{3}{6}\frac{0}{5}$ths, and in the left ear $\frac{2}{6}\frac{5}{5}$ths. Galton's whistle was heard in the right ear up to 65 only.

The operation of stapedectomy was advised for the right ear with an unfavorable prognosis and was done January 26th, without general anæsthesia. Five drops of a ten per cent. solution of cocaine were thrown into the right nostril the head being inclined to the right and backward, and a solution of the same strength was applied in the process of making a cut in the membrana tympani which was accomplished with very little pain. The descending process of the incus and the stapes articulation were plainly visible, but the stapes was found to be firmly anchylosed in the niche.

The tendon of the stapedius was fully divided and dis-articula-

tion from the incus easily effected, but gentle traction with the hook had no effect in mobilizing the stapes, and more forcible traction resulted in fracture of both crura about midway of their length. The patient described the sensation as a distinct grating during the division of the incudo-stapedial articulation and as a sharp report accompanying the fracture of the stapes.

There was no slowing of the pulse and no vertigo.

One month later the hearing for the tuning-fork (562 v. s.) aërially in the right ear $\frac{10}{60}$, with slight apparent improvement after catheterization.

One month later the tuning-fork was not heard at all aërially in the right ear, while the hearing by bone-conduction remained the same.

Mrs. A. F., forty-two years of age, had for many years considerable impairment of hearing resulting in the left ear from a past suppurative process and in the right from a chronic thickening of the tympanic mucous membrane. The Politzer acoumeter was not heard at all in the right ear, the tuning-fork (562 v. s.) was heard aërially $\frac{15}{60}$ths and by bone-conduction over the mastoid $\frac{20}{60}$ths. The voice was heard at a distance of four feet in an ordinary conversation tone, but was understood only within one foot, and Galton's whistle was not heard at all. In this case the long continuance of the deafness as the result of a definite sclerotic process made it probable that there would be a bony anchylosis at the base of the stapes and atrophy of the crura, which was found to be the case as, following tympanotomy under cocaine, the division of the incudo-stapedial articulation was effected with difficulty and the stapes broke through both crura on slight traction, the head and about one half of each crura attached being carried upward and backward by the pull of the stapedius muscle. There was very little appreciation on the part of the patient of the noise made in the middle ear during the operation and the hearing was not improved.

The following case, while it resembles in some respects, both as to history and impairment of hearing, the preceding cases, differed from them in its results, and serves to illustrate the ease with which the operation of stapedectomy may be performed without general anæsthesia, under favorable anatomical conditions and in a good subject; it also illustrates one of the symptoms occasionally incident to the removal of the stapes.

Mr. D. L., sixty years of age, had a progressive impairment of hearing resulting from the changes in the middle ear originating in repeated acute inflammations of the ear in childhood. Both drum-heads were intact but much thickened and opaque; this was especially the case in the left ear, where the hearing for the tuning-fork (562 v. s.) was aërially $\frac{1}{6}\frac{0}{0}$ths, and by bone-conduction over the mastoid $\frac{8}{6}\frac{0}{0}$ths; the voice in an ordinary conversation tone was heard and but partially understood only within a distance of two feet, and the Galton whistle was heard only throughout the lower half of its register. Notwithstanding this marked impairment of hearing, the principal discomfort was caused by a deep-toned circulatory tinnitus.

The operation done May 20th was begun without the preliminary injection of cocaine and the usual incision following the posterior periphery gave little pain until the upper limit was reached, when a two per cent solution of cocaine was used and the cut continued along the superior periphery and down upon the malleus painlessly.

On completion of the opening into the tympanum the hearing for the voice and for the tuning-fork improved and the annoying tinnitus ceased, but the incudo-stapedial articulation being plainly in view and apparently anchylosed, the stapedius tendon was cut, the incudo-stapedial articulation divided, and the stapes easily extracted by means of the blunt hook without breaking and with slight suction resistance; the hearing immediately fell to zero apparently and the tinnitus returned. Within ten minutes after the operation the patient became so dizzy as to make it necessary to put him to bed, where he willingly remained forty-eight hours. There was slight nausea but no vomiting, and the vertigo decreased after a night of natural sleep, but continued when he left the hospital at the end of the second day, and in a lesser degree three days later when it was also found that the tinnitus was decreasing and the hearing improving.

Immediately after the operation in this case a paper dressing was applied, there being no evidence of serous or other fluid outflow from the niche; at the end of five days the paper dressing was dry and firmly in place.

(*To be continued.*)

MUCOCELE AND EMPYEMA OF THE ETHMOIDAL CELLS AND SPHENOIDAL SINUSES, CAUSING DISPLACEMENT OF THE EYEBALL; THEIR OPERATION FROM THE ORBIT.[1]

By HERMAN KNAPP, M.D.

THE air in the cavities which surround the nasal passages may be replaced by liquids of different character—serous, sero-hemorrhagic, mucous, muco-purulent, and purulent. These differences have a great influence on prognosis and treatment. I purpose to confine my communication to the ethmoidal and sphenoidal sinuses, which form a group for themselves, though their affections not infrequently extend to the frontal sinuses, even to the malar antrum, and *vice versa*.

By parenthesis I may mention another cavity which is not, but might be, reckoned among the accessory sinuses of the nose. I mean the lachrymal sac. This cavity empties into the nose, and is in structure and the nature of its diseases similar to the others. It has a cushion of cavernous tissue at the orbital end of the lachrymal canal, the pathological swelling of which leads to dilatation of the sac by serum, mucus, and pus. Caries, necrosis, and polypoid formations are frequent and show the same symptoms as in the other cavities. Its diseases scarcely ever result from affections of the eye, but from those of the nose. Their treatment also is conducted on principles of nasal surgery. Thus they belong more to the rhinologist than to the oculist. An important feature the diseases of the lachrymal sac have in common with the pneumatic cavities around the nose is their tendency, in the severer cases, to encroach upon the orbit.

---

[1] Read before the Section of Laryngology and Otology of the Am. Med. Assoc. at Milwaukee, June 7, 1893. An abstract will appear in the Journal of the Association.

My ophthalmic practice has, for many years, brought to my observation a greater number of cases of nasal disease which by their extension involved inordinate responsibility. I shall here not refer to cases which I have published, but to some recent ones that appear to be of sufficient interest to engage the attention of the reader.

CASE I.—*Distension of all the cavities by a serous or sero-hemorrhagic exudation.*

The serous variety has come to my notice in one example only, and this was not in my own practice, but in that of Dr. Robert Abbe, of New York, who six weeks ago was kind enough to send the patient to my clinic for an opinion. He also invited me to be present at the operation, which he performed May 15, 1893.

The patient, a girl of sixteen years, had had an obstruction of the left nostril for years. The left eye became considerably pushed out and forward, a hard, slightly uneven swelling occupied the upper half of the inner wall and the inner-upper corner of the orbit ; the right eye gradually was displaced in the same way. The left eye became blind from inflammation and subsequent atrophy of the optic nerve. The right, from the same cause, is almost blind now. In this condition the patient fell into the hands of Dr. Abbe. Dr. Abbe punctured the tumor from the left orbit with an aspirator needle. The syringe filled with a brown watery liquid, which contained a great quantity of cholesterine. He then made an incision along the upper-inner part of the orbital margin, penetrated through the bony membranous wall, explored the cavity with a probe and his finger, found it 3½ to 4″ deep, very broad, and lined with soft, rather thick mucous membrane. The ethmoidal cells were one large cavity, and through a constriction the finger penetrated into the enlarged sphenoidal sinus. The cells and sinus of the other side were likewise enlarged. A very great quantity of brown, cholesterinic liquid had apparently filled all this system of cavities. Dr. Abbe passed a metallic catheter behind the soft palate, pressed its tip against the anterior wall of the left sphenoidal sinus, put his finger into the sinus, and felt the tip of the probe through the anterior wall. Guided by the catheter and his left

forefinger he then pierced the wall of the sinus with a curved, sharp-pointed tenotome, which he had introduced through the orbital wound and the ethmoidal cells. After cleansing the cavity he passed a strip of iodoform gauze through the orbital wound and the sinus into the pharyngeal cavity, pulled it out through the mouth, and filled the ethmoido-sphenoidal cavity with the continuation of the strip, thus establishing drainage into the pharynx.

May 22d.—Dr. Abbe was kind enough to write me the following notes: "The patient had a rise of temperature to 102°. Twenty-four hours after the operation I removed the gauze by the posterior wound, and inserted a tube through the opening in the orbit. The temperature rose still higher, but fell to the normal afterward. The wound is now draining freely of clear, straw-colored fluid. I have let the pharyngeal opening close, and irrigate with Thiersch's fluid. Temperature normal.

"*June 5th.*—The patient is now out of danger. The drainage into the pharynx has re-established itself, and irrigation through a small tube in the orbital sinus passes into the throat and shows no pus. The discharge is practically nothing. Nasal breathing is now free, whereas before the operation it was entirely oral. The eyeballs are less protruding; sight, perhaps, a little better. The girl is walking about and in good general health."

CASE 2.—*Mucocele of the ethmoidal cells operated on from the orbit. Rapid recovery.*

Mrs. F. Joseph's daughter H., æt. twenty, consulted me for the first time June 12, 1888. She had chronic coryza and was hard of hearing. The eyeball was displaced outward and downward. Through the soft parts a hardish tumor was felt extending from the inner canthal ligament to the upper orbital margin. It was immovable, painless, not fluctuating. Movements, sight, visual field, and ophthalmoscopic condition of the eye normal. The patient had had treatment for her nose, had been "burned" repeatedly but to no purpose. I found the nasal passages free and without marked intumescence of the turbinated bodies. The patient had a delicate constitution and complained of headaches. My diagnosis was mucocele or empyema of the ethmoidal cells. I advised an operation, and as she was not prepared to have it done at once, ordered boric acid spray for the nose and sojourn in the mountains. She consulted me twice more, and as there

was no improvement in the protrusion of her eye, she consented to the operation in November.

The *operation* was done at the New York Ophthalmic and Aural Institute, under ether, November 28, 1888. A curvilinear incision, about 4 *cm* long, was made from the junction of the middle and inner thirds of the supra-orbital margin, down the side of the nose as far as the ligamentum canthi internum. When the surface of the tumor was laid bare about 2.5 *cm* vertically and 2 *cm* horizontally, its wall was incised. A considerable quantity of muco-purulent, non-offensive liquid gushed forth. The cavity was explored and scraped with a sharp spoon. It went about 4 *cm* backward, not upward into the frontal sinus. It contained some granulation tissue which was removed. Its inner wall was smooth, nowhere carious. The cavity was syringed out with a solution of mercuric bichloride, 1:5000, a larger perforated silver tube with a flange put in, the upper part of the skin wound stitched up, and the whole covered with bichloride gauze and absorbent cotton, held in position with strips of isinglass plaster. There was very little hemorrhage, no diplopia, no limitations of the movements of the eye, but the left frontal region was anæsthetic. The recovery was undisturbed. No reaction from the operation, no suppuration, almost no secretion. The tube was left off on the seventh day, and the wound allowed to close. The tumor on the inner-upper side of the eye diminished in size. In about six weeks its seat felt only slightly more prominent than the corresponding place of the other orbit. I may mention that sixteen days after the operation a herpetic eruption occurred in the region of the supra-orbital nerve. It disappeared in a week, but the insensibility of that region was not restored before several months had elapsed. The patient has been seen several times since. Her recovery has been complete and permanent.

A similar case was the following:

CASE 3.—*Empyema of the ethmoidal cells, operated from the orbit. Speedy and complete recovery,*

Mrs. R. Weiler, of New York, about fifty-five years old, was brought to me by her family physician, Dr. Wiener. She had suffered from pain in the eye and surroundings for two months. No marked symptoms on the part of the nose. October 10, 1892, her left palprebral fissure was found smaller than the right.

The left upper lid drooped, but could be raised at will. The caruncle and mucous membrane lining the inner-upper part of the orbit were swollen, soft, painless. In this region a hemispherical, rather hard, but not bony, tumor was felt, more marked at the roof than at the inner wall of the orbit. H $\frac{1}{12}$, S $\frac{20}{20}$. Ophthalmoscopic condition and movements normal. The eye was slightly displaced out and downward. My diagnosis was empyema of the frontal sinus and perhaps the ethmoidal cells.

The *operation* was performed at the New York Ophthalmic and Aural Institute, November 3, 1892. A curved incision, 4 *cm* long, laid the tumor bare. On opening its wall a large quantity of pus flowed out. The sharp spoon discovered a cavity about 3 *cm* in diameter with bare and rough walls which were scraped with a sharp spoon. On probing, no communication of the cavity with the frontal sinus could be ascertained.

The cavity was syringed with corrosive sublimate, 1:5000. A large silver drainage tube was inserted, the upper part of the wound closed with sutures, and the wound dressed with corrosive sublimate gauze and absorbent cotton. The frontal region was insensible, the eye moved normally, there was no diplopia.

Several days after the operation the patient was restless, did not sleep much, had pain in the head and behind the eye. The upper lid and conjunctiva were œdematous, the eye more protruding, but there was no fever and no secretion. In a few days the swelling went down, pus escaped through the drainage tube, the cavity was syringed daily, the discharge diminished, and the patient returned to her home on the eleventh day. The drainage tube was left off three weeks after the operation. A week later she was virtually cured. The upper-inner corner was scarcely more swollen than on the other side and the eye had resumed its natural position. May 26, 1893, almost seven months after the operation I saw her again. She had been well in every respect, except that the left frontal region had not yet fully regained its sensibility.

Affections of the sphenoidal sinuses are, as far as I am aware, mostly complicated with like affections of the ethmoidal cells. The two following cases are in point:

CASE 4.—*Exophthalmus from empyema of the ethmoidal and sphenoidal sinuses. Opening from the orbit, three years*

ago. Discharge and fistula ever since. Discharge diminishing of late.

Percy Grace, of Brooklyn, æt. thirteen, consulted me first Aug. 1, 1888. Protrusion of left eye had been noticed three months previously, and increased steadily. No injury or other assignable cause. No marked symptoms from the nose. The eye was bulging and pushed to the temporal side, but freely movable. At the inner canthus a hard, round protuberance was felt on the orbital wall, almost the size of a cherry. Interior of the eye normal, $V = \frac{20}{20}$. Field complete. Diagnosis: osteoma, osteo-sarcoma, or empyema of the ethmoid,—most likely the latter. Operation advised. The patient was seen several times, but not until April, 1890, did the parents consent to the operation. The tumor and the exophthalmos had increased. No external inflammation. Optic disc somewhat raised, veins enlarged, showing pressure from the tumor on the optic nerve, probably from extension into the sphenoidal sinus.

April 21, 1890, at the N. Y. Ophthalmic and Aural Institute, under ether, the tumor was laid bare by a curved incision. Its wall could easily be cut into, a puriform, brownish liquid escaped in large quantity. The opening was enlarged. With a probe a large cavity with smooth walls, divided by a horizontal band, was made out. Careful scraping with a sharp spoon brought out no granulation tissue. The probe could be passed $2\frac{1}{2}$ inches straight backward, there being arrested by bone tissue, evidently the posterior wall of the sphenoidal sinus. Syringing liberated more of the chocolate-brown puriform tissue. Two drainage tubes were inserted, the one straight backward, the other backward and slightly upward, not so much as to enter the frontal sinus. It seems that there was a communication between the ethmoidal and sphenoidal cavities, leaving a horizontal strip between them.

There was no fever, the exophthalmus and the tumor diminished, the congestion of the optic nerve and retina disappeared. The wound was dressed and syringed daily. The same quantity of puriform liquid came out, and when one of the tubes was left off, or the syringing omitted, the wound swelled and the patient had pain in the head and behind the eye. After the operation there was some fever (temp. 101°), which soon disappeared. The patient left the hospital twenty-eight days after the operation. The contents of the cavities, examined under the microscope, contained mucus, granular detritus, and blood corpuscles.

When the fistula had existed for months without diminuation of the discharge, I advised the patient to see a rhinologist, in the opinion that an internal opening might be established which, if it did not cure the discharge, might at least remove the necessity of the permanent external fistula. The walls of the nasal passages were not conspicuously abnormal. Dr. Lincoln took charge of the patient, removed portions of the lower and middle turbinated bodies, opening the ethmoid cells. It had a good effect upon the width of the nostril, but not on the discharge, and to this day the fistula, with two silver tubes, has persisted, giving no other discomfort than its mere presence. The discharge has, of late, become scant, and the liquid injected escapes through the nose. There is some hope for an ultimate recovery. The silver tubes have blackened the skin near the fistula. I advised the boy to replace them by gold ones.

The next is a parallel case to the preceding.

CASE 5.—*Empyema of the ethmoidal and sphenoidal sinuses. Exophthalmus. Operation from the orbit. Thus far* (four months) *persistence of external fistula, but with diminishing secretion.*

Sam. Hasslacher's son, J. G., æt. fifteen, Scranton, Pa., consulted me, December 12, 1892. For many years has had offensive discharge from the nose, and for the last three years exophthalmus of varying degree on the left side. Eye pushed forward and downward. S $\frac{20}{20}$. Mobility, tension, field, and fundus normal. No nasal or pharyngeal disease. Posterior rhinoscopy impossible, but palpation shows pharynx to be free. An immovable, hemispherical, slightly uneven tumor, not so hard as bone, the size of a large split cherry, occupied the upper-inner angle and the upper half of the inner wall of the orbit. I advised operation, and, with the mother's consent, performed it under ether at the "Institute," January 26, 1893. The incision through the wall of the tumor evacuated a great deal of brownish muco-pus. On probing the cavity extensive caries was found in different directions. No communication with the frontal sinus could be established. The wound was dressed and the cavity syringed every day. On February 1st and 2d the upper lid and the tumor swelled again and the discharge stopped. February 3d I enlarged the wound and made it deeper. A good deal of blood and muco-purulent sub-

stance escaped. A new posterior cavity, evidently the sphenoidal, had now been opened, for the probe could be introduced 6 *cm* straight backward. The cavity was scraped with a sharp spoon, but nothing worth mentioning was brought out. There had been some fever (temp. up to 101°), but it soon disappeared. The middle turbinated was somewhat swollen. When the patient blew his nose, more secretion came through the canula; several times when the wound was syringed out the liquid entered the nose. The discharge through the silver tube formed in considerable quantity and was regularly syringed out. As it showed no tendency to diminish, I called in consultation Dr. T. Myles, whose anatomical demonstrations of the nose have received so much attention. He examined the patient several times, found enlargement of the middle turbinated, and proposed to make a counter-opening into the nose. Knowing how difficult it is to keep such perforations open, I wanted to treat the patient for a time yet by syringing out the cavity through the external fistula. He improved very satisfactorily, and left the hospital March 7, 1893. The exophthalmus and the tumor have almost disappeared; the interior of the nose shows less swelling, and the patient went home May 10th, to continue the treatment and report again later.

I may add here the report of a remarkable case which I saw only twice, in the year 1887. At the time the diagnosis was a puzzle to me, but became clear, I think, from the subsequent history.

CASE 6.—*Exophthalmus with rapid loss of sight from empyema of the sphenoidal sinus.*

A strong, healthy-looking gentleman, C. K. D., æt. fifty, of St. Paul, consulted me February 10, 1887. He told me that three months ago, after many exposures and great exertions in stump speaking for four months, his left eye protruded enormously down and out, the lids were swollen; the sight had diminished, first in the centre then on the sides; in four days it was lost completely. At the same time he had articular rheumatism. The protrusion of the eye began to diminish five weeks later. I found the eye still somewhat prominent but free from pain. Optic disc white; arteries small, pulsating on pressure. Sight totally lost. Right eye normal. He has been an excessive smoker, fifteen to twenty

cigars a day; has drunk but little. These are my notes, and I regret that I did not examine his nose carefully, but there was nothing to draw my attention to a difficulty in the nose. Examination of the orbit by palpation and otherwise discovered no cause for the exophthalmus. An information which I accidentally received later makes the diagnosis of this case clear. On enquiry Mr. D. was kind enough to write me a letter of which the following is of importance: "I had no particular difficulty with my nose previous to my ear trouble, except perhaps a slight catarrh. After I saw you the left nostril began to be obstructed and finally closed up completely. So I went to Dr. Gardner who is not a specialist but a very accomplished man. He pronounced it polypus and proposed to burn it out by electricity. As he was burning away the hot instrument gave a plunge and a large quantity of pus came from my nose, which in my opinion settled the cause of my blindness."

In the light of our present knowledge we may fairly suppose that this was one of those cases of empyema of the sphenoid which cause exophthalmus and sudden blindness.

In conclusion I beg to report an example of—

CASE 7.—*Empyema of all the sinuses, which terminated fatally by meningitis.*

The patient, Catherine Burckhard, of Brooklyn, a stout woman of fifty-seven years, was brought to my clinic at the College of Physicians and Surgeons January 3, 1893. Her left upper eyelid and the skin over the lachrymal sac were shining, red, hard, and swollen. The eyeball was displaced downward and outward. In the upper-inner corner of the orbit and some distance down the inner wall a moderately hard swelling was felt. It was immovable and sensitive to the touch. The patient had suffered long from naso-pharyngeal catarrh. I diagnosed empyema of the left frontal sinus and ethmoidal cells. The same day, before the students, I made an incision in the swollen skin at the inner-upper canthus. Not striking pus at once, I enlarged the incision, laid the tumor bare, cut into its wall, and evacuated a considerable quantity of thin pus. The probe penetrated upward into a large cavity, through the left frontal sinus into the right. The cavity was syringed out and drained with a silver tube. The patient was admitted to the New York Ophthalmic and Aural

Institute. At first some pus flowed through the tube, but then it stopped and the patient felt bad ; her temperature went up to 103° and 104°. It was reduced by antipyrine and antifebrine. Thin, sanious pus then came out through the tube. The temperature kept high, the pulse was 130 and 140 on January 14th. She felt weaker, had a sallow skin, pinched features, relaxed sphincters, and died suddenly January 15th, at 1:30 A.M.

The autopsy, made on the same day, showed purulent meningitis at the base and convexity. The pus communicated through the cribriform plate of the ethmoid and defects in the roof of the orbit with the nasal cavity and the frontal and ethmoidal cells. All the sinuses contained thin pus, and had white, even walls with scarcely any lining of mucous membrane. The left antrum of Highmore was filled $\frac{1}{3}$ of its size. Necrosis was seen nowhere, but caries in many places, also on the surface of the left middle turbinated bone.

The autopsy showed that there had been caries and suppuration in all the accessory sinuses of the nose. The left frontal and ethmoidal cavities were distended toward the eye. A fresh acute suppuration had started in them at her last illness ; it extended into the brain and caused her death.

REMARKS.

Reviewing the cases under consideration, we find the different kinds of exudation represented. In the *first* (Dr. Abbe's) there was a sero-sanguineous exudation full of cholesterine. These cases may be rare, but they are not unknown, and I think that Dr. J. H. Bryan, in the *System of Diseases of the Ear, Nose, and Throat*, edited by Dr. C. H. Burnett, goes too far when, vol. i., p. 473, he says : " Under the term hydrops antri was formerly described an affection characterized by an accumulation of serous fluid in the antral cavity, containing cholesterine, and accompanied by a distension of the anterior wall of the sinus. These were, in all probability, cases of dentigerous cysts. Hydrops of this cavity, in its true sense, does not exist, and the term should be dropped from our list of diseases as misleading."

To this statement I may reply that a dental cyst will not

fill all the sinuses as it did in Dr. Abbe's case, and there was nothing in these sinuses but serous fluid and cholesterine.

The *second* case was a plain and pure mucocele of the ethmoid cells. The opening from the orbit afforded a thorough evacuation of the cavity; there was no subsequent discharge, no fistula. Primary union and permanent recovery was the result of the operation.

The same happy termination was noticed in the *third* case, though the contents of the cavity were more purulent than mucous.

Why certain cases recover so readily, while others do not, apparently under the same conditions, is a matter of conjecture. The conditions of the walls of the cavity—ulcers, caries, necrosis, granulations, and polypi—play, no doubt, an important part in the mode of healing in such cases, and therefore it is necessary to examine carefully with a probe the walls of the nostrils before the operation, and with straight and bent probes and sharp spoons the walls of the cavities during and after the operation. Caries and necrosis are probably the cause of the protracted healing or incurability of many cases, just as chronic otorrhœa in many cases is cured only by a thorough removal of all the dead substances in the drum cavity and its surroundings. The patency, stenosis, or closure of the mouths of these cavities no doubt have also something to do with the formation and retention of morbid material, as we daily see in lachrymal diseases. If there is stricture in the tear duct and no inflammation in the sac, clear watery liquid can be pressed out (hydrops sacci lacrymalis), but if inflammation is present, the contents of the tumor are either mucus or pus. It is remarkable that the accessory cavities are not more frequently the seat of retained liquids than we are aware of, for their orifices are mostly small, and all situated in the upper portions of their walls. The reason of this, it seems to me, is that the exudations disappear not so much by flowing out through the mouths of the cavities as by natural absorption as soon as their source, the productive inflammation, is removed. Collections of pus in the anterior chamber vanish when the corneal abscess by nature, galvano-

cautery, or other treatment is converted into a clean, non-secreting ulcer. It is well known that during acute coryza the neighboring cavities fill with secretion which disappears when the coryza is over.

The *fourth* and *fifth* cases were empyemas of the ethmoidal and sphenoidal sinuses in which the operation cured the orbital tumor and the exophthalmus, but the secretion has continued, though diminished in quantity. Under the microscope the peculiar puriform secretion shows the element of pus, but in the last case which I examined bacteriologically no micro-organisms were found.

The *sixth* case, exophthalmus with rapid blindness, is very important and certainly rare. In literature several such cases are mentioned, but I know of no other example in my own experience. It shows that oculists, when they come across a case of exophthalmus, without a tangible cause in the orbit, should think of a possible affection of the sphenoidal sinus, especially when the exophthalmus is acute and connected with conjunctival swelling and impairment of sight. I imagine that empyema of the sphenoidal sinus may exist for a long time without producing eye symptoms; then suddenly, as we see in chronic dacryo-cystitis, an acute abscess develops, which makes the tissue in the apex of the orbital pyramid congested and œdematous, participating in the inflammation, and compressing the optic nerve before or after its entrance into the optic foramen. This may lead to optic neuritis, or, as we see in erysipelas (of which I published a typical case in the *Arch. of Ophthal.* vol. xiii., p. 83), to compression of the arteries and veins in the orbit, retinal hemorrhage, and thrombosis. Both conditions may cause optic nerve atrophy. The periodic œdema of the subconjunctival tissue, accompanied by more or less protrusion of the eyeball, which, for want of a better diagnosis, is called tenonitis, may also be caused by transient inflammations of the sphenoidal or posterior ethmoidal sinuses. Under all circumstances it is well for oculists to keep this possibility in mind. The case under consideration had been diagnosticated by nobody, though it was seen by many.

In the *seventh* case, empyema of all the sinuses, the pus

had evidently made its way into the cranial cavity through the cribriform plate and the defects in the upper wall of the frontal sinus when the patient presented himself. The operation came too late to save his life.

I abstain from making any remarks about the diagnosis of mucocele and empyema of the ethmoidal and sphenoidal sinuses, as they are well enough treated in most text-books. Some good monographs may be specially mentioned.

E. BERGER and J. TYRMANN: Die Krankheiten der Keilbein-Höhle u. des Siebbein-Labyrinthes u. ihre Beziehungen zu den Erkrankungen des Sehorgans. Wiesbaden, J. F. Bergmann, 1886.

E. BERGER: Rapports entre les Maladies des Yeux et celles du Nez et des Cavités Voisines. Paris, O. Doin, 1892.

L. GRÜNWALD: Die Lehre von den Naseneiterungen mit besonderer Rücksicht auf die Erkrankungen des Sieb- u. Keilbeins u. deren chirurgische Behandlung. München and Leipzig, J. L. Lehmann, 1893.

SCHÄFFER: Chirurgische Erfahrungen in der Rhinologie u. Laryngologie. Wiesbaden, J. F. Bergmann, 1885.

The *treatment* of these diseases is very important, as spontaneous recovery has scarcely ever been observed, whereas surgical interference is not dangerous to life, benefits almost all cases, and produces a permanent, perfect cure in many.

Care of the nose, if there is disease, should not be omitted. When exophthalmus is present, *i. e.*, when the orbital wall has yielded, treatment of the nose alone has rarely been attempted, and only in exceptional cases proved successful. Yet, in my opinion, it deserves to be more extensively tried.

The ethmoidal cells may be opened from the middle meatus, where a pointed instrument at the hiatus semilunaris will readily penetrate into the anterior cells. This may, in many cases, be sufficient for the complete evacuation of pus and subsequent irrigation, as frequently the pathological process breaks down the partition walls of the cells. In other cases the perforation has to be placed higher up, and farther back into the upper meatus. In the majority of such cases the middle turbinated bone has to be

pierced, especially when the medial wall of the cells is conspicuously bulging (Zuckerkandl's bulla ethmoidalis).

The opening of the sphenoidal sinus can in some cases, as Schäffer has proved, be done according to the proposition of Zuckerkandl, by passing the instrument over the medial side of the middle turbinated bone into the upper meatus, and piercing the upper part of the anterior wall of the sinus where its natural orifice is. In the majority of cases it will be necessary, however, to remove a portion of the middle turbinated in order to get free access to the anterior wall of the sphenoidal sinus. The openings into these cavities should be as large as possible and kept free by daily syringing and the use of a sharp spoon. I need not mention that immediately after opening the sinuses, their walls should be explored with straight and curved probes, and scraped with a sharp spoon if polypi, caries, and necrosis are present.

All these operations are new and I have no personal experience in them. They appear rational and I am ready to perform them in suitable cases. Their great drawback lies in the difficulty of keeping the perforations open. Even broad resections of the inner wall of the malar antrum in the lower nasal meatus could in certain cases, says Grünwald, by the most persistent care, not be prevented from closing so that it was necessary to establish a permanent fistula in the canine fossa.

Operating in the depth of the nose is particularly difficult on account of the narrowness of the canal in which the instruments have to work, and on account of the bleeding which, in spite of cocaine, often is profuse. A few weeks ago I extirpated an intranasal cyst (a mucocele) the size of a large walnut, by detaching, according to Dieffenbach, the wing of the nose from the cheek through an incision of an inch in length. The wing being held upward with a tenaculum I had a sufficiently free field before me to remove the whole tumor. The wound healed by first intention. I got the impression that this incision might be very useful in many intra-nasal operations.

I am quite familiar with operating on the accessory cavities of the nose from the orbit, be it for empyema, osteoma,

or sarcoma. This mode has the advantage of exposing the cavities to view. For the upper sinuses, the frontal, ethmoidal, and sphenoidal, the incision is curvilinear along the brow and nose. The surface of the tumor is laid bare and an exploratory incision will reveal its character if it has not been ascertained before by an aspirator needle. In the case of mucocele or empyema, a large incision is made into the wall of the tumor, and when probing or scraping discovers caries or polypi a portion of the wall should be exsected so as to lay the cavity largely open, examine its walls, and act accordingly, as we do in mastoid operations. In uncomplicated cases a silver drainage tube may be sufficient to produce a speedy recovery. In cases complicated with caries, etc., the cavity has to be carefully cleansed of all morbid substances with a sharp spoon, irrigated, and filled with sublimate or iodoform gauze; then cleansed and irrigated every day until the exophthalmus and orbital swelling have disappeared and the discharge has ceased. Treating the nostrils, if there is any need for it, should not be neglected. When such treatment has been continued for months or years a counter-opening into the nasal passages may be made and a metallic or rubber tube passed from the orbital wound into the nose. Irrigation and removal of granulations and carious or necrosed bone is all we can further do. If under this treatment recovery is not obtained, a permanent external fistula has to be accepted as a compromise. The operations from the orbit *per se* are of no danger. The naturally easy drainage prevents propagation into the deeper parts. In the cases which I have seen terminate fatally the meningitis had always started before the operation was made, or the disease—polypi or sarcoma—was so extensive as to render a radical removal impossible.

During the operation the frontal nerve is cut, which leaves an anæsthesia for a number of months without any consequences.

The avoidance of injuring the pulley or tendon of the superior oblique muscle has always to be kept in mind during the operation, lest diplopia be the result. This accident has never occurred to me and I think it need not

occur. The pulley is attached to the inner side of the periorbita, close by the supra-orbital notch. By carrying the incision at the edge of the orbit both up and inward, the pulley falls outside of it, so much the more as the expansion of the inner-upper angle of the orbit through the tumor crowds the pulley away from the margin. It is prudent, however, to be careful while detaching the periosteum from the tumor and use a spatula for that purpose, rather than a sharp knife. An anatomical specimen which I beg to demonstrate, and which every one can easily prepare for himself, will make those relations clear.

In conclusion, gentlemen, let me say that the subject which I have taken the liberty of submitting to your consideration has an old but scant and widely scattered literature; yet not until very recently has it been systematically studied. The impulse to this systematic study has been given not by general surgery, nor by ophthalmology, but by the highly gratifying development of modern rhinology.

MISCELLANEOUS NOTES.

I.—BRITISH.

A.—MEETINGS OF SOCIETIES.

HARVEIAN SOCIETY.—At a meeting held on February 2d, Mr. Edward Owen read a paper on Post-Nasal Growths in Children, and showed two interesting cases in which the normal pharyngeal tonsil could be seen through wide clefts in the palates of the patients. A most interesting discussion followed, in which Mr. Butlin, Mr. Mark Hovell, Drs. Scanes Spicer, Felix Semon, Silk, and others took part. The general opinion appeared to be that instrumental removal by means of forceps or a curette was much to be preferred to simple scraping with the finger-nail, and that the patient should be carefully anæsthetized in the recumbent position.

NORTHUMBERLAND AND DURHAM MEDICAL SOCIETY.—At the meeting held on February 9th, Dr. Robertson exhibited an example of Bezold's mastoiditis, and also a specimen of post-nasal sarcoma removed by means of the galvano-cautery snare.

LEEDS AND WEST-RIDING MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on February 17th, Dr. Adolph Bronner showed specimens illustrating the anatomical relations of the lateral sinus, mastoid cells, attic, and middle ear.

CLINICAL SOCIETY OF LONDON.—At the meeting held on March 10th, Mr. Raymond Johnson gave particulars of a case in which he had excised the tonsil for sarcomatous disease, the secondary glandular growths being removed at the same time. The external carotid artery was first tied, and all the diseased structures were removed through the incision in the neck.

PATHOLOGICAL SOCIETY OF LONDON.—At the meeting held on March 21st, Dr. George Stoker related a case in which the history pointed very directly to an attack of pulmonary hæmoptysis, but in which the blood spitting was found to be actually due to a papillary fibromatous mass attached to the middle and lower turbinated bones. The hæmoptysis ceased on removal of the diseased tissue.

BRITISH MEDICAL ASSOCIATION—Birmingham and Midland Counties Branch.—At the meeting on February 24th, Mr. Marsh showed a man, aged twenty-one, suffering from primary lupus of the epiglottis. Griqualad West Branch (Africa).—At the March meeting, 1892, Dr. Matthias read a paper on Otorrhœa, advocating the use of an irrigator for washing out the tympanum and Eustachian tube. At the July meeting Dr. Watkins read the notes of a case of post-pharyngeal abscess. At the November meeting Dr. Symonds showed a button removed from the nose after twenty years.

BRADFORD MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on March 7th, Dr. Adolph Bronner read a paper upon Naso-Pharyngeal Diseases, and a discussion followed. At the meeting held on May 2d, Dr. Kerr made some remarks and showed specimens from a child aged seven, that had died after trephining the mastoid cells for symptoms secondary to chronic middle-ear disease. Recent infective infarcts were found in the lungs.

CLINICAL SOCIETY OF MANCHESTER.—At the meeting held on March 21st, Dr. Milligan showed patients in whom Stacke's modified mastoid operation for suppurative middle-ear disease had been performed with satisfactory results.

ROYAL ACADEMY OF MEDICINE IN IRELAND.—At the meeting held on February 24th, Dr. O'Carroll showed a specimen of pachymeningitis from a boy aged ten; the result apparently of an extension of the inflammatory process from the middle ear.

MEDICAL SOCIETY OF LONDON.—At the meeting held on April 24th, Mr. Spencer Watson exhibited a mucous polypus of unusually large size that he had removed from the right nasal fossa of a patient.

HUNTERIAN SOCIETY.—At the meeting held on April 25th, Dr. Stowers communicated the particulars of a case of melanotic sarcoma of the left ear in a girl aged eleven. Microscopic sections of the growth were also shown.

B.—APPOINTMENTS.

J. W. BARRETT, M.D., Ch.M. Melb., F.R.C.S. Eng., has been appointed Honorary Surgeon to the Victorian Eye and Ear Hospital, Victoria, Australia, *vice* Bowen, resigned.

P. S. WEBSTER, M.D. Durh., M.R.C.S., L.R.C.P. Lond., has been appointed Honorary Assistant Surgeon to the Victorian Eye and Ear Hospital, Victoria, Australia.

C.—NEW SOCIETY.

We have much pleasure in recording the formation of a new Society, viz., THE LARYNGOLOGICAL SOCIETY OF LONDON, the first general meeting of which was held in the last week in March. The officers of the Society are as follows: PRESIDENT: Sir George Johnson, M.D., F.R.S. VICE-PRESIDENTS: Felix Semon, M.D.; P. McBride, M.D. TREASURER: Mr. H. T. Butlin. LIBRARIAN: F. de Havilland Hall, M.D. SECRETARIES: E. Clifford Beale, M.B.; Scanes Spicer, M.D. COUNCIL: Mr. Cresswell Baber, Dundas Grant, M.D., Greville MacDonald, M.D., D. Newman, M.D., W. McNeill Whistler, M.D. We cordially wish the Society every success.

II.—AMERICAN.

A.—MEETINGS OF SOCIETIES.

The regular meeting of the New York Otological Society was held May 23, 1893, at 8 P.M., at the office of Dr. E. B. Dench, 17 West 46th Street.

Dr. H. A. Alderton exhibited a tube which he had found useful in cases of otitis externa, both for securing drainage and affording the patient a means of thoroughly irrigating the ear.

Dr. E. B. Dench presented an improved Galton whistle, upon which any note from 1024 vibrations per second to 32,000 vibrations per second could be sounded. The device was intended to

replace the higher tuning-forks used in the functional examination of aural cases.

Dr. Gruening called attention to the misuse of the term "Post-aural Abscess," as occurring in children. He believes that the condition is always due to mastoiditis, and that in every case a thorough operation should be done, the antrum opened freely, and any other cells present should be thoroughly exposed and curetted. After such an operation the middle ear usually needs no attention, and suppuration ceases at once. In the discussion which followed Drs. Bacon and Dench agreed with the speaker, and Dr. Dench called attention to the danger of necrosis of the squamous portion of the temporal bone and perforation into the cranial cavity in cases where free drainage was not secured. He cited two cases reported in detail. Dr. Pomeroy had also reported a similar case, and believed that in every instance a swelling of the tissues behind the ear in children called for external incision. Drs. Friedenberg and Knapp thought that simple incision often sufficed; the last-named speaker has seen spontaneous recovery and called attention to the fact that œdema of the tissues might simulate a deep-seated purulent collection.

Dr. Knapp reported a case in which a sebaceous tumor of the oil cyst variety originating in the ear canal had, after perforating the membrana tympani and the cartilaginous portion of the canal, finally appeared as a tumor behind the auricle. The diagnosis as to the local condition was difficult, owing to the obliteration of the external meatus by its swollen posterior wall. The contents of the cyst were evacuated by an incision behind the ear, and drainage effected by means of a silver tube inserted at first into the wound and later into the external meatus. Under the microscope the tumor clearly showed the transition from a sebaceous to an oil cyst.

Dr. J. E. Nichols reported a case in which he had removed a lipoma as large as a hen's egg from the posterior surface of the auricle close to its line of insertion. The tumor at first appeared to be cystic, but a histological examination revealed its true nature.

Dr. J. E. Sheppard reported two cases of mastoid caries occurring in diabetic patients aged fifty-one and fifty-eight years, respectively. Both cases were operated on successfully. In both the tissues seemed to possess less reparative power than usual, as

evidenced by the excessive production of granulation tissue in one instance, and profuse suppuration in the other.

Dr. Bacon remarked that in his opinion diabetes in advanced life would make him hesitate about performing any serious operation.

Dr. Knapp expressed the opinion that although the presence of diabetes rendered patients more susceptible to suppurative processes, it did not of itself contra-indicate operative interference if necessary.

Dr. Bacon referred to a case, presented at a previous meeting, in which, as a result of chronic mastoid inflammation, the external canal had been almost obliterated. It had been a question whether the disease was not of a tubercular or syphilitic nature. Upon operation the posterior wall of the canal was found to be carious ; all softened bone was removed and the patient made a prompt recovery.

Dr. Knapp remarked that tubercular mastoiditis might occur without involvement of the middle ear, and advocated the use of cod-liver oil in these cases.

Dr. Bacon mentioned two cases of hereditary syphilitic disease of the ear which had improved upon large doses of the iodide of potassium. He also cited an instance, reported by S. Buck, in which this same treatment had proved efficacious.

Dr. Knapp was certain that no decided improvement was effected in these cases by the iodide, and in this opinion he was supported by Dr. Gruening, who advocated the use of pilocarpine.

Dr. Buck, referring to the case he had reported, was certain of the marked improvement following the use of iodide of potassium in large doses.

Dr. Dench reported a case of facial paralysis of ten days' duration, caused by a cholesteatomatous mass in the upper part of the tympanic cavity. The hearing had been very poor in the ear for fifteen years or more, and there had been previous slight attacks of facial paresis which had disappeared spontaneously. Examination revealed that the tympanic cavity had been the seat of a previous suppurative process, although no history of this could be obtained. The remains of the membrana tympani, the malleus and incus, and the cholesteatoma were removed through the canal. The malleus, incus, and superior wall of the canal at its inner extremity were carious. All softened bone was removed with the curette, and as the process seemed limited to the tym-

panic cavity the mastoid was not opened. The patient made a complete recovery; the paralysis disappeared completely, the hearing became very good, and the ear remained free from discharge.

Dr. Buck called attention to the frequency of mastoid sclerosis in cases of cholesteatoma, which had also been the experience of the previous speaker.

Dr. Nichols reported a case of aspergillus recently seen in which a piece of silk formed the nucleus of the foreign deposit. The mycosis was of a variety frequently found in horses.

Dr. Pomeroy called attention to the value of powdered cocaine both as a styptic and anæsthetic in middle-ear operations. In his experience the results were much more satisfactory than with the strongest solutions.

PHILADELPHIA COUNTY MEDICAL SOCIETY, June, 1893.—At the regular meeting of the society Dr. B. Alexander Randall made some excellent remarks upon the mastoid operation. It is his opinion that the operation should be radical in its nature, and that all diseased tissue should be completely removed. Care upon the part of the operator, and attention to the anatomical peculiarities exhibited by each particular mastoid at the time of operation, will usually enable the surgeon to avoid important structures or to protect them from violence. Cranial measurements are of no value in determining the position of the sinus or middle cerebral fossa in any case.

The speaker strongly advocated the performance of such operations by the otologist rather than by the general surgeon.

B.—APPOINTMENTS.

Dr. Edward B. Dench has been appointed Professor of Otology at the Bellevue Hospital Medical College, New York, and

Dr. Justine L. Barnes, Adjunct Professor of Otology at University Medical College, New York.

C.—EDITORIAL NOTICE.

Nos. 1 and 2 (double number) of vol. xxiv. of the German edition of these ARCHIVES issued in April, 1893, contains the following, not yet translated papers:

1. BEZOLD, average hearing power in old age.
2. BLOCH, binaural hearing.

3. STEINBRÜGGE, the depression of Reissner's membrane.

4. SUCHANNECK, microscopy of the human nasal cavity, especially the olfactory membrane.

5. SCHMIEGELOW, cases of mastoid disease.

6. MOOS, new tuning-forks.

7. MOOS, diagnostic value of percussing the mastoid.

All these papers will appear in extenso or abridged in the English edition as soon as practicable.